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DCVIII.—TEA BLIGHTS.

(*With Plate.*)

The field of nature is one of incessant struggle. Every plant has to hold its own in the face of foes bent continuously and relentlessly on its destruction. If it succeeds it is only because its defensive resources are on the average superior to the attacks made upon it. The final result is one of equilibrium, in which foe and victim each manage to survive. This is arrived at through the interaction of conditions usually difficult to trace, but brought into adjustment after a long period of struggle.

When man appears on the scene and for his own purposes destroys the adjustment, the struggle begins anew with increased severity. He grows some one plant in wide stretches after clearing the ground of its competitors. But in so doing he relaxes the restraint of all its foes and often gives them a chance they have never possessed before.

Plants and their parasites have to live in nature as best they may. The host can do without the parasite, but the parasite cannot do without the host. A plant may exist alone in a forest and the parasite which kills it will find its own fate sealed if it cannot transfer its attacks to a neighbouring individual. The straits to which a parasite in consequence is put to continue its existence, and the varied means by which this is effected, form one of the most fascinating subjects of biological study. But the net result is that under natural conditions the parasite is kept in check.

When any crop is grown on a large scale it is obvious that the conditions are changed. A parasite having by accident fastened on an individual plant in a plantation and done its fatal work, can then extend, usually with little difficulty, to contiguous plants. Under such circumstances the spread of a fungoid disease can only be compared to a conflagration, which beginning on a small scale may increase to disastrous dimensions. Such troubles are part of the price which man has to pay for disturbing the order of nature. The only way to treat them is to endeavour

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either to restore the natural checks which man has abolished, or, as this can from the circumstances of the case rarely be done, to substitute artificial ones in their place. And as a matter of practice, by an attentive study of the habits of the parasite, this can generally be effected and the injury it inflicts circumvented.

The difficulties which beset tea-culture in Assam are only an illustration of these general principles. But the Government of India does not possess any trained mycologist in its service, and no one was available for the study of the "Blights" which affect Indian tea-culture, but Dr. Watt, its Reporter on Economic Products. When a similar investigation was needed for the poppy crop, it was entrusted to a gardening member of the staff of the Royal Botanic Garden, Calcutta. Dr. Watt was obliged to have recourse to Kew for the technical investigation of the most serious maladies with which the tea-planters have to contend. The following report has been drawn up, from material transmitted by Dr. Watt, by Mr. Massee, a Principal Assistant in the Herbarium of the Royal Gardens.

Grey Blight.

(*Pestalozzia Guepini*, Desmaz.)

The amount of injury caused to the tea plantations by this fungus is estimated by Dr. Watt as follows:—"I regard the *Grey Blight* as very alarming, a disease that if not checked may easily reduce the productiveness of gardens by fifty per cent. It might, in fact, convert Assam from the prosperous province the planters have made it, to one of extreme distress."

An examination of the fungus sent from Assam on leaves of the tea plant, showed it to be identical with the parasite common on leaves of cultivated species of *Camellia* in Europe. The fungus first appears under the form of small grey spots, more or less circular in shape; these spots gradually increase in size and not infrequently run into each other, forming large, irregular blotches which often eventually cover the greater portion of the surface of the leaf. During increase in size, the spots are often bordered by a narrow dark line. The grey or sometimes white colour of the spots is equally evident on both surfaces of the leaf, and is due to the disappearance of the chlorophyll, and the subsequent death of the cells composing the tissue of the leaf. The mycelium of the fungus is very delicate, rarely exceeding $2\,\mu$ in diameter, hyaline, and sparingly transversely septate; it at first occupies the intercellular spaces and runs between the cells, which eventually become separated from each other by a dense weft of mycelium. Finally the mycelium enters the cells and vessels in considerable quantity, causing the death of the invaded patches, the unattacked portion of the leaf remaining quite unchanged. When the leaf-tissue of the diseased patches is quite dead and brittle the mycelium of the fungus becomes aggregated in numerous dense tufts just beneath the cuticle, more especially on the upper surface of the leaf. On the tips of these aggregations of slender, erect hyphae, or conidiophores, which spring from a basal pseudoparenchymatous stroma, the conidia are borne. As these clusters of conidia increase

in size they raise the cuticle of the leaf into a series of minute warts, until finally the tension is too great, and the cuticle ruptures, usually in a triangular slit through which the mature conidia protrude and soon become free on the surface of the leaf, from which they are removed by wind or rain. Such of those as happen to alight on the moist surface of the leaf of a suitable host-plant, germinate at once, enter the tissues of the leaf, and form a new centre of disease, which in course of time produces conidia. By this rapid method of conidia-formation and distribution, it can be readily understood how possible and certain it is for the disease to spread rapidly when once introduced into a tea garden.

The conidia are produced at the apex of slender hyphae or conidiophores, and are very beautiful objects when seen under the microscope, being narrowly elliptic with somewhat pointed ends, and usually three-septate ; the two end cells are colourless, while the two median cells are olive-brown, the terminal colourless cell being surmounted by four very slender, colourless, spine-like processes longer than the conidium itself. The above-described is the typical and most abundant form of conidium ; variations occur in the number of septa, which range from two to four ; the hair-like appendages also vary from one to four, or are sometimes entirely absent.

The life-history of the fungus was ascertained from a series of cultures ; living conidia being obtained from the fungus growing on *Camellias* cultivated at Kew.

Conidia germinated freely within eighteen hours in hanging-drop cultures in ordinary tap water. The median dark-coloured cells of the conidia are alone capable of germination, each cell as a rule producing a single germ-tube ; in rare instances two germ-tubes spring from a cell, one of which remains rudimentary. On sterilised bread a dense white superficial mycelium soon appears, on the surface of which very minute dark points, consisting of groups of conidia are visible about the third day. Five days after sowing, the conidia are mature and capable of germination, but bread does not appear to be a very suitable medium for the cultivation of this fungus, the characteristic terminal, filiform appendages of the conidia being almost constantly below the number normally present, and in certain tufts entirely absent. The spineless condition of conidium agrees exactly with the fungus described by Cooke as *Hendersonia theicola*, parasitic on living tea leaves from Cachar, which is in reality nothing more than an abnormal form of *Pestalozzia Guepini*, and has also been observed on *Camellia* leaves at Kew. Examples of these abnormal spineless conidia, sown on plum-juice gelatine, gave origin to perfectly normal conidia within a week, in fact only normal conidia were produced on the last-mentioned nutrient solution, whether normal or exceptional conidia (in so far as the number of apical spines were concerned) were sown. It is quite an easy matter to inoculate living uninjured *Camellia* leaves by placing conidia on the damp under surface of the leaf, and keeping it moist for two or three days. No result was obtained when the conidia were placed on the upper surface of the leaf.

Pestalozzia Guepini is not known to possess any other form of fruit or mode of reproduction than the condition described above.

The disease under consideration is by no means new ; specimens of tea leaves attacked by the *Pestalozzia*, now in the Kew Herbarium, are accompanied by the following note. "Tea leaves (blighted). Cachar. 1872 growth. A. H. Blechynden." A second lot of tea leaves, suffering from the same disease, is accompanied by a note as follows. "Leaves from a tea tree recovering from 'red spider.' Sap just beginning to run through them. This tree like many thousands has not given any leaf for three months. T. B. Curtis. Received from Mr. Blechynden, Calcutta, by T. B. C., October, 1878."

The fungus occurs as a parasite on leaves of plants belonging to the following genera :—*Camellia*, *Rhododendron*, *Citrus*, *Magnolia*, *Alphitonia*, *Niphobolus*, and *Lagerstræmia*.

Owing to its wide distribution at the present day, the original home of the fungus is difficult to determine with certainty, but the amount of evidence at hand suggests an Eastern origin. In India it occurs on *Camellia* and *Rhododendron* ; in Europe it is by no means uncommon, but always on introduced plants belonging to the two above-named genera. In the United States it occurs on introduced species of *Camellia* and *Citrus*, from which it may possibly have passed on to the native *Magnolia*. On the other hand, it occurs on indigenous plants (*Niphobolus*) in New Zealand, and on *Alphitonia* in Queensland.

Preventive measures.—If the diseased leaves were collected with the amount of care and intelligence exercised in collecting sound leaves, and burned at once after being collected, the disease would soon be stamped out, as the mycelium of the fungus is not perennial in the tea plant ; consequently infection, and a recurrence of the parasite, depends entirely on inoculation by the numerous conidia or reproductive bodies of the fungus present on diseased leaves. Remembering the very different kinds of plants on which the fungus is known to be parasitic, it is very probable that it also occurs on wild plants growing in the vicinity of the tea gardens ; if such proves to be the case, all such plants should be removed if practicable, as the conidia of fungi are carried considerable distances by wind, birds, and insects, and no amount of attention in the way of removing the parasite from the tea plants would avail, if the supply of conidia requisite for inoculating the tea plants were formed on other plants growing in the neighbourhood.

The name of the fungus, together with the synonymy, is as follows :—

Pestalozzia Guepini, *Desmaz.*, Ann. Sci. Nat., Ser. 2, XIII., 182, tab. 4, figs. 1-3 (1840).

Syn. Pestalozzia inquinans, Karst., Hedw., 1891, p. 301.
Pestalozzia Camelliæ, Passer., Rev. Myc., 1887, p. 146.
Coryneum Camelliæ, Massee, Grev., XX., 8 (1891).
Hendersonia theicola, Cooke in Sacc. Syll., IV., No. 2334 (1884).

Fig. 1, Leaf of tea plant showing the pale patches formed by "grey blight" (*Pestalozzia Guepini*) ; nat. size. Fig. 2, Section through a pustule of the fruit of the fungus ; × 100. Figs. 3 & 4, Conidia of the fungus ; × 400. Fig. 5, Conidia germinating ; × 400.

Blister Blight.

(*Exobasidium vexans*, Massee).

The amount of injury caused by this parasite, along with an interesting account of its general appearance and mode of life, will be gathered from the following account by Dr. Watt :—

" One of the very worst blights on tea is known to the planters as *Blister Blight.* At first it seemed to me as if this might prove a species of blister mite (*Phytoptus*), but I am now disposed to regard it as a fungus, and possibly a species of *Exoascus* or *Taphrina.* In tube No. 257 I have sent specimens of the disease in all stages, from young leaves showing translucent spots, to pieces of leaves showing well-formed circular blisters, also the further stages of the blisters appearing hairy (under the lens), and others turned quite black. The history of the disease is somewhat striking. It invariably appears on tea that has not been pruned in the autumn. About April it extends to the pruned tea, which has by then come into leaf. At first it looks like a minute pink spot, which, on being viewed through the leaf, is seen to be surrounded by a pale margin. This widens, and the upper surface of the leaf at this point becomes depressed into a circular pit that appears shining and moist. The under surface looks like a wart of a white, woolly appearance. These warts, as they enlarge, unite together and invade the shoots until the whole of the affected parts shrivel up. The woolly surface of the warts thus seems to be covered with white filaments, but I could never detect these as bearing spores. Shortly after this the leaves and shoots turn quite black, and fall to the ground. At this stage the tea plantation looks as if it had been burned. I have seen hundreds of acres completely ruined in this manner. But in two months or so, new shoots appear, and the blight is not seen again, as a rule, till next spring, and even then spasmodically, and where unpruned tea exists. It was very bad in the spring of 1895, and in 1897 I could not discover a bush with this blight in the very gardens where, at the time of my first visit, all operations had been completely stopped by it."

The view entertained by Dr. Watt as to the fungous nature of the parasite proved to be correct, microscopic examination showing it to be an undescribed species of *Exobasidium*, possessing features of interest from the mycological standpoint, more especially in the production of a dense layer of conidia which covers the surface subsequently occupied by the hymenium. The earliest indication of the disease is the appearance of translucent spots in the leaf, due to the disappearance of the chlorophyll and starch grains ; this is followed by a rapid increase in the number of cells constituting the spongy parenchyma of the leaf and situated within the area occupied by the mycelium of the fungus.

The conspicuous blisters present on leaves that have been attacked for some time, are caused by the secondary increase in the number of leaf-cells over a limited area of the surface being resisted by the healthy unyielding tissues of the leaf; hence the abnormal growth, stimulated by the action of the parasite, assumes the form of a blister, being concave on the upper, and convex on the under surface of the leaf. When the points of infection are numerous on a leaf, the originally distinct blisters grow into each other during their development. The mycelium is very slender, not exceeding 2μ in thickness, sparingly transversely septate, and tinged with yellow when seen in the mass. It runs between the cells, which finally become much distorted and separated from each other. After becoming concentrated in clusters between the epidermal cells of the convex surface of the blister, on the under surface of the leaf, the mycelium ruptures the cuticle and appears on the surface of the blister under the form of minute, densely crowded clusters of hyphae. When the growth of the parasite is very vigorous the hymenium is not infrequently formed on both surfaces of the blister. Some of these hyphae run out into long, sterile filaments, giving a minutely downy or velvety appearance to the blister, when seen under a lens; the great majority of the hyphae, however, remain short, and produce a single conidium at the apex. The conidia are hyaline, or with a tinge of yellow when seen in the mass, elliptic with somewhat pointed ends, 1-septate, slightly constricted at the septum, straight, or sometimes very slightly curved, measuring $14–16 \times 5–6\mu$. It is not unusual to find conidia germinating *in situ*, each cell of the conidium producing one slender germ-tube. Mixed with the conidiophores are numerous basidia, but these are not sufficiently crowded and compact to form a typical hymenium, the surface of the tuft constantly remaining loose in texture, resembling the face of a brush rather than a waxy, compact surface. The basidia are subcylindric, and so far as observed, constantly produce two slender, spine-like sterigmata, although the presence of four daughter nuclei in some preparations of basidia stained with iodine-green, would seem to suggest the probability of four sterigmata being found in some instances. The spores are hyaline, continuous, glabrous, ovate-oblong, often slightly inaequilateral, $5 \times 3\mu$. When old, the tufts of hyphae appear to contract a little, thus becoming more isolated and distant from each other, and giving the hymenium a cracked appearance.

The branches do not appear to be disfigured to the same extent as the leaves by the parasite.

Preventive measures.—Remembering the statement by Dr. Watt that the disease "invariably appears on tea that has not been pruned in the autumn," it seems almost superfluous to suggest that autumn pruning should be carried out, unless there is some very strong reason for not doing so. The removal of diseased portions before the spores are mature would go far towards preventing a recurrence of the disease. Such infected parts should be burned, and not allowed to remain on the ground. Spraying would not, in all probability, be permissible, otherwise a solution of potassium sulphide (one ounce to three gallons of water) would prevent to a great extent the spread of the disease, if applied at the

time when it first appears. All known species of *Exobasidium* are parasites, forming blisters or galls on the leaves and branches of the host plant ; the flowers and fruit are sometimes also attacked. Species belonging to the following genera are known to serve as host plants :—*Rhododendron*, *Vaccinium*, *Andromeda*, *Cassandra*, *Arctostaphylos*, *Ledum*, *Saxifraga*, *Laurus*, *Symplocos*, *Arrhenatherum*, and *Bromus*. The above list of genera belonging to widely separated orders of plants, suggests the possibility of some ally of the tea plant also serving as a host for the "blister blight," and if such exist in the forest adjoining the tea plantations, there is but little hope of eradicating the disease until such nurse-plants are removed from the vicinity.

The following is a diagnosis of the species :—

Exobasidium vexans, *Massee.*

Hymenophora innata, effusa, forma varia, vulgo orbicularia vel oblonga, in foliis infestatis bullas supra concavas infra convexas 4–12 mm. diam. interdum confluentes formantia. *Hymenium* leve, siccitate rimosum, initio pallidum, dein ætate albo-pruinosum. *Basidia* cylindracea 30–35 × 5–6 μ, 2-sterigmatifera ; sterigmata aculeata, 3 × 0·5 μ. *Sporæ* ovato-oblongæ, continuæ, hyalinæ, glabræ, sæpe inæquilaterales, 5 × 3 μ. *Conidia* fusiformia, hyalina, 1-septata, ad septum leviter constricta, 14–16 × 5–6 μ.

On living leaves and branches of *Camellia Thea*. Assam.

Fig. 6, Leaf of tea plant, with blisters formed by blister blight (*Exobasidium vexans*) ; nat. size. Fig. 7, Section through a blister ; × 100. Fig. 8, Portion of hymenium of same, showing numerous conidia, *a*, and basidia, *b*, bearing two spores each ; × 400. Fig. 9, Free spores ; × 400. Fig. 10, Conidia ; × 400.

Thread Blight.

(*Stilbum nanum*, Massee).

This very remarkable fungus, while agreeing technically with the genus *Stilbum* in the structure of the conidiophore, differs very materially in the presence of an elaborately branched, sterile stroma composed of densely interwoven, slender, sparsely septate, vaguely branched hyphae, 2–3 μ in diameter, combined to form a thin, white membrane, which is inseparable from the bark or leaf on which it grows. This sterile felted mycelium often forms white patches several inches in length on the bark of living branches, and then breaks up into irregularly-branched slender strands, many of which are not thicker than thread, hence the planter's name "*thread blight*." The delicate white strands of mycelium run along the surface of the bark to the tips of the young shoots, branching and anastomosing irregularly ; thence they not infrequently pass on to the leaves, where they form a yet more delicate, irregularly branched pattern. Microscopic examination of a diseased branch shows that the slender mycelium is at first most abundant in the cambium zone, and extends to the young wood, the vessels of which soon become choked with a dense weft of mycelium. A slight browning of the tissues indicates the progress of the mycelium. This internal mycelium passes through the substance of the bark, and gives origin to the superficial strands

of mycelium described above. The branches are eventually killed owing to the destruction of the cambium zone and choking of the vessels of the wood by mycelium. So far as can be observed from an examination of the ample supply of material forwarded by Dr. Watt, the fruit of the fungus is only produced after the branch on which it occurs is dead, when it appears on the surface of the bark under the form of miniature pins about half a line high, and of a pale yellow colour. These fruits generally occur in large numbers, giving to the branch a minutely velvety or hairy appearance as seen with the naked eye.

In the absence of living material it is impossible to state definitely in what manner the fungus first gains access to the interior of the living plant; but the general habit suggests the idea of its being a root-fungus, first attacking the slender rootlets, and afterwards extending into the above-ground portions of the plant. If mycelium is found in quantity on the thicker root-branches and about the base of the trunk, the above supposition would doubtless be correct, and would imply the presence of strands of mycelium in the soil; such strands probably traversing the soil and extending from one plant to another, as is known to be the case in other root-parasites, as *Dematophora Necatrix* and *Rosellinia radiciperda*. The fungus described above is in all probability only the conidial phase of some higher form, which, as is usually the case, only forms its fruit on thoroughly decayed portions of the host plant.

Preventive measures.—If examination, as indicated above, shows the fungus to be a root-parasite, a trench should be made round the base of the stem, as deep as practicable without injuring the roots, and filled with lime, or failing this, with wood ashes. Deep narrow trenches should be made enclosing batches of diseased trees, for the purpose of checking the spread of underground mycelium from diseased to healthy trees. Under any circumstances branches killed by the disease should be collected and burned, otherwise the conidia formed on such branches will be carried by wind and other agencies, and infect healthy plants. Care should be taken to ascertain whether the fungus is present on wild plants growing in the vicinity of the plantations, as no amount of care exercised on the tea plants to prevent the disease will avail if the fungus is present on other plants that grow near at hand.

The following diagnosis will enable the fungus to be recognized by a mycologist:—

Stilbum nanum, *Massee* (sp. nov.).

Conidiophora minutissima, vix 0·5 mm. alta, gregaria, flavida. *Stipites* æquales, tenues. *Capitula* globosa vel obovata. *Conidia* numerosissima, minuta, hyalina, continua, elliptica, muco primitus obvoluta, 5 × 2·5μ.

On living branches and leaves of *Camellia Thea*. Assam.

Fig. 11, Branch of tea plant attacked by "thread blight" (*Stilbum nanum*), showing the white sterile mycelium running over the bark, also the fruit of the fungus; nat. size. Fig. 12, Fruit of the same; × 100. Fig. 13, Section through a head of fruit, showing the conidia borne at the tips of the hyphae which form the head; × 400.

DCIX.—FUNGI EXOTICI, I.

The collections enumerated below have been recently received at Kew for determination. With the object of rendering possible a more exact knowledge of the geographical distribution of Fungi, lists of all the species communicated are given under their respective countries.

Spitzbergen.

The following fungi were detected on plants collected during the Conway Expedition by Mr. A. Trevor-Battye.

Pyrenomycetes.

Pleospora Drabæ, *Schröter*, *Nord. Pilz.* (1881) p. 15.
On *Braya alpina*, Sternb. et Hoppe, Red Mount.

Sphærella Agrostidis, *Auersw. Myc. Eur. Pyr.* p. 17, fig. 79, ex *Sacc. Syll.* i. (1882) p. 526.
On dead grass leaves.

Sphæropsideæ.

Septoria Saxifragæ, *Passer. in Rev. Mycol.* ii. (1880) p. 36.
On *Saxifraga Hirculus*, Linn., The Flower Garden, Advent Bay.

Diplodina Arenariæ, *Massee (sp. nov.)*. *Perithecia* cæspitosa, subepidermica, ostiolo erumpentia, globoso-conica, contextu parenchymatica, fuscidula, 5 mm. lata. *Sporidia* elongato-clavulata, utrinque obtusiuscula, medio 1-septata, ad septum demum subconstricta, hyalina, curvula rectave, 25–30 × 6–7 μ ; basidia hyalina, 25–30 × 2–2·5 μ.
On pedicels and fruit of *Arenaria verna*, Linn., The Glen, Red Mount.
Distinguished from all known species of *Diplodina* by the large perithecia and spores. At first immersed, globose, and astomous, finally a papillate ostiolum developes and pierces the epidermis, and about half the entire perithecium becomes erumpent.

Coniothyrium arundinaceum, *Sacc. in Michelia* i. (1879) p. 203.
Dane's Island. On fading leaves of *Phippsia algida*, R. Br.

China.

The interesting fungus described below was collected and communicated by Mr. George M. H. Playfair, H. B. M. Consulate, Ningpo, China.

Hyphomycetes.

Triglyphium niveum, *Massee (sp. nov.)*. *Sporodochia* hypophylla, subeffusa, nivea, innato-erumpentia, 0·5–1 mm. lata. *Conidia* hyalina, breviter 3-radiata, 16–20 μ diam., radiis apice obtusatis.

Parasitic on leaves of *Machilus Thunbergii*, Sieb. et Zucc., Ningpo.

The small, snow-white erumpent patches superficially resemble the work of some *Coccus*. Distinguished from *Triglyphium album*, Fresen., the only other species, by the conidia being larger and constantly 3-rayed.

India.

Specimens of fungi, accompanied in some instances by sketches or photographs, have been received from Mr. J. S. Gamble, M.A., F.L.S., Conservator of Forests, N.W. Provinces; Brigade-Surgeon J. E. T. Aitchison, M.D., C.I.E., F.R.S.; and Mr. G. Marshall Woodrow, F.L.S., Poona Coll. of Science.

Basidiomycetes.

Lepiota altissima, *Massee* (*sp. nov.*). *Pileus* membranaceus, albidus, centro tantum carnosus, e convexo-plano subumbonatus, squamis concentricis innatis subsquarrosus, ad marginem fimbriatus, fibrosus, circiter 8 cm. latus. *Lamellæ* liberæ, subconfertæ, albæ, dein pallide flavæ. *Sporæ* ovatæ, 8 × 5 μ; basidia subclavata, 28–30 × 8–10 μ. *Stipes* a pileo discretus, albus, cylindraceus, bulbillosus, fistulosus, tandem usque ad 25 cm. longus, apice vix 1 cm. crassus. Annulus persistens, fimbriatus.

Bombay. Growing in open pastures, near Poona, *Woodrow*, 22.

A very distinct species belonging to the group of *L. procera*. In all probability edible.

Collybia rupicola, *Massee* (*sp. nov.*). *Pileus* centro excepto submembranaceus, e campanulato expansus, fusco-cinereus, margine primitus subinvolutus, velutino-squamulosus, 2–4 cm. latus. *Lamellæ* postice attenuato-annexæ, distantes, albæ, dein griseæ, acie crenulata. *Sporæ* subglobosæ, hyalinæ, 5–6 μ. *Stipes* fistulosus, sursum attenuatus, pileo concolor, undique densissime lanato-hirsutus.

N. W. Provinces. Cæspitose, on naked rocks, Jehri Garhwal, alt. 7500 ft., *Gamble*, 25478.

Hymenochæte leonina, *Berk. et Curt. in Journ. Linn. Soc.* x. (1869) p. 334.

N. W. Provinces. On dead bark, Jaunsar, *Gamble*, 25701.

Lachnocladium himalayense, *Massee* (*sp. nov.*). *Truncus* crassiusculus, elongatus, 8–10 cm. circiter, pallide rufescens. *Rami ramulique* rugulosi, teretes vel subcompressi, axillis arcuatis, alutacei, dein cinnamomeo-fuliginei, apicibus pallidis ætate nigricantibus. *Sporæ* subglobosæ, hyalinæ, 4–5 μ.

Sikkim. On the ground in fir forests, Phallaloong Ridge, alt. 10000 ft., *Gamble*, 99.

Corticium cœruleum, *Fries*, *Hym. Eur.* (1874) p. 651.

N.W. Provinces. On old dry wood, emitting a phosphorescent light, Lachiwala Forest, Dehra Dun, *Gamble*, 25600.

Erinella corticola, *Massee* (*sp. nov.*). *Ascomata* 1–1·5 mm. alta, 0·5 mm. lata, gregaria vel subsparsa, primo globosa, dein erumpentia, planiuscula, extus puberula, albida, margine ciliato pallido, disco pallido vel ochraceo. *Stipes* brevissimus, cylindraceus, bulbillosus, albus. *Asci* cylindracei, 90–100 × 6–7 μ, iodo haud tincti. *Sporæ* hyalinæ, filiformi-fusoideæ, pluriguttulatæ, demum 9–11-septatæ, 55–60 × 1·5 μ. *Paraphyses* fusoideæ, ascis longiores, 3–4 μ latæ.

N. W. Provinces. On bark, Dehra Dun, *Gamble*, 25545.

Ustilagineæ.

Ustilago segetum, *Winter in Rabenh. Krypt. Fl.* i. (1814) p. 90. N. W. Provinces. Dehra Dun; on wheat, *Gamble*, 25681; on *Cynodon Dactylon*, Pers., 25680; on oats, 25682.

Ustilago olivacea, *Tul. in Ann. Sci. Nat.* sér. 3, vii. (1847) p. 88. N. W. Himalaya. On *Carex condensata*, Nees, *Gamble*, 25069.

Uredineæ.

Gambleola, *Massee* (*gen. nov.*). *Teleutosporæ* biloculares, concatenatæ, ex omnibus partibus arctissime coalitæ, columellam cylindraceo-elongatam efformantes, sporidiolis globosis hyalinis. *Uredosporæ* haud evolutæ.

Superficially resembling *Cronartium*, but differing in the teleutospores being two-celled, and in the absence of uredospores around the base of the column of teleutospores. *Masseella* differs in its teleutospores being one-celled, and not concatenate.

In the present genus, the teleutospores are for the most part two-celled, resembling those of *Gymnosporangium*, each cell having two germ-pores situated near to the median septum. Promycelium elongated, 2–3-septate near the apex, each cell producing a spherical, hyaline sporidium. Although the teleutospores are cemented together on every side, to form the column, yet when crushed they are seen to be arranged in parallel chains.

Gambleola cornuta, *Massee* (*sp. nov.*). *Columellæ* teleutosporarum gregariæ, cæspitosæ, cylindraceæ, filiformes, flexuosæ curvatæque, umbrinæ, usque ad 3 mm. longæ. *Teleutosporæ* oblongatæ, utrinque attenuatæ, 40–50 × 10–12 μ, ad septum vix constrictæ, fuscidulæ, loculis 2-poris.

N. W. Provinces. On living leaves of *Berberis nepalensis*, Spreng., Chakrata, alt. 7000 ft., *Gamble*, 24387.

The cylindrical sori of teleutospores are caespitose in tufts of 5–9 individuals, brown and somewhat flaccid when moist, becoming rigid and blackish when dry. Parasitic on the under, or very rarely on the upper surface of living leaves.

Uromyces Hobsoni, *Vize in Grevillea* iv. (1876) p. 115. *Sori* in maculas tumidas rubro-brunneas in Jasmini ramulis foliisque dense aggregati; sori in ramulis 1–4 cm. longi; sori in utrisque paginis foliorum plus minusve orbiculares, 2–4 mm. diam., subtus arcte concavi, supra convexi. *Teleutosporæ* ellipticæ, apice basique acutæ vel subobovatæ, dilute fulvæ, leves, pariete apice incrassato,

48–51 × 20–24 μ; pedicelli hyalini, æqualiter filiformes, 118–121 × 6–7 μ. *Æcidia* alba, circa 0·5 mm. diam., marginibus hinc inde fissis revolutisque. *Æcidiosporæ* hyalinæ, leves, globosæ vel ob pressionem irregulariter angulatæ, 14–15 μ diam.

BOMBAY. On *Jasminum sp.*, Kolapore, *Colonel Hobson*.

N. W. PROVINCES. Dehra Dun, *Gamble*, 25283.

In all the specimens examined the teleutospores are quite mature, nevertheless, on several patches, scattered æcidia are present, showing that these structures had preceded the teleutospore condition on the same patch.

Puccinia coronata, *Corda, Icon. Fung.* i. (1837) p. 6, t. 2, fig. 96.
N. W. PROVINCES. The æcidial form on living leaves of *Rhamnus purpurea*, Edgew., Deoban, alt. 9000 ft., *Gamble*, 24427.

Puccinia Graminis, *Pers. Disp. Fung.* (1797) p. 39, t. 3, fig. 3.
N. W. PROVINCES. The æcidial form on living leaves of *Berberis vulgaris*, Linn., Deoban, alt. 8000 ft., *Gamble*, 25779.

Puccinia fusca, *Wallr. Fl. Crypt.* ii. (1833) p. 220.
N. W. PROVINCES. The æcidial form on *Anemone rivularis*, Buch-Ham., Deoban, alt. 9000 ft., *Gamble*, 24409.

Melampsora Hypericorum, *Winter in Rabenh. Krypt. Fl.* i. (1884) p. 241.
N. W. PROVINCES. On living leaves of *Hypericum cernuum*, Roxb., Jaunsar, alt. 7000 ft., *Gamble*, 25711.

Melampsora epitea, *Thümen in Mitth. Vers. Oest.* ii. (1879) p. 1.
N. W. PROVINCES. On living leaves of *Salix elegans*, Wall., Deoban, alt. 9000 ft., *Gamble*, 24399.

Uredo Oldenlandiæ, *Massee* (*sp. nov.*). *Sori* minuti, amphigeni, maculas non formantes, 300–500 μ diam., sparsi vel inordinate gregarii, prominuli, epidermide primo tecti, tandem apice rupto pallide ochracei. *Uredosporæ* oblongæ vel obovatæ, episporio pro ratione tenues, ubique dense et minutissime echinulatæ, sessiles, raro pedicellatæ, hyalinæ, 20–25 × 10–12 μ.

N.W. PROVINCES. On living leaves of *Oldenlandia sp.*, Jehri Garhwal, alt. 4000 ft., *Gamble*, 25441.

The sori are pale ochraceous when dry, but are in all probability white when fresh, the spores are colourless. It resembles *U. Cussoniæ*, Cooke & Mass., in habit and general appearance, but differs distinctly in the spores.

Æcidium Clematitis, *DC. Fl. Fr.* ed. 3, ii. (1805) p. 243.
N. W. PROVINCES. On living leaves of *Jasminum humile*, Linn., Jaunsar, alt. 9000 ft., *Rogers*.

SPHÆROPSIDEÆ.

Catinula leucoxantha, *Massee* (*sp. nov.*). *Perithecia* sparsa, superficialia, 1–1·5 mm. diam., albida, disco concaviusculo humido plicato-cavernoso luteo. *Basidia* filiformia, 30 × 1·5 μ, hyalina, sporulis ellipsoideis utrinque acutissimis 8–10 × 2 μ hyalinis.

N.W. PROVINCES. On living leaves of *Leucas hyssopifolia*, Benth., Dehra Dun, *Gamble*, 24584.

Distinguished from all known species by the whitish exterior and irregularly lacunose, yellow disc. There are usually 2–4 perithecia on a leaf, mostly hypophyllous.

Hyphomycetes.

Fusarium pannosum, *Massee* (*sp. nov.*). *Sporodochia* erumpentia, 5–10 cm. diam., suborbicularia, sæpe confluentia, amœne cinnabarina, carnosa, compacta. *Hyphæ* repentes, dense intricato-ramosæ, parce septatæ, 4–5 μ crassæ, hyalinæ. *Basidia* parce ramulosa, ramulis fusoideis, conidiis fusoideo-falcatis utrinque acutissimis 3-septatis ad septa interdum constrictis 35–38 × 5 μ.

Punjab. On living trunk of *Cornus macrophylla*, Wall., Murree, alt. 7000 ft., *Aitchison*.

A very remarkable species, in some instances nearly covering the trunk, and thus forming a conspicuous object at some considerable distance away. Thick, felt-like, and somewhat gelatinous when moist, becoming much contracted and wrinkled when dry.

Straits Settlements.

Specimens sent to Kew for determination by Mr. H. N. Ridley, M.A., F.L.S., Director, Gardens and Forest Department, Singapore.

Basidiomycetes.

Lentinus blepharodes, *Berk. et. Curt. in Journ. Linn. Soc.* x. (1869) p. 301.

State of Selangor. On a stump.

Lentinus exilis, *Fries*, *Epicr.* (1838) p. 393.

Singapore. On dead wood, Botanic Gardens, *Ridley*, 10.

Fomes australis, *Sacc. Syll.* vi. (1888) p. 176.

Singapore. On dead wood, Botanic Gardens, *Ridley*, 2, 11.

Fomes semitostus, *Sacc. Syll.* vi. (1888) p. 200.

Singapore. On wood, Botanic Gardens, *Ridley*, 1.

Polystictus xerampelinus, *Sacc. Syll.* vi. (1888) p. 282.

Singapore. On wood, Botanic Gardens, *Ridley*, 12.

Polystictus flabelliformis, *Sacc. Syll.* vi. (1888) p. 216.

Singapore. On rotten wood, Botanic Gardens, *Ridley*, 9.

Polystictus sanguineus, *Fries in Nov. Act. Soc. Sci. Upsal.* i. (1851) p. 75.

Singapore. On dead trunks, Botanic Gardens, *Ridley*, 13.

Irpex flavus, *Klotzsch in Linnæa* viii. (1833) p. 488.

State of Selangor. Growing on the living trunks of coffee trees, and said to be the cause of a serious disease, attacking the plants at the collar, *Ridley*, 19.

Stereum nitidulum, *Berk. in Hook. Lond. Journ. Bot.* ii. (1843) p. 628.

Singapore. On the ground, Botanic Gardens, *Ridley*, 8.

Stereum vellereum, *Berk. in Hook. f. Fl. N. Zel.* ii. (1855) p. 183.

Singapore. On dead wood, Botanic Gardens, *Ridley*, 5.

Lachnocladium furcellatum, *Sacc. Syll.* vi. (1888) p. 738.

State of Selangor. On rotten wood, Batu Caves, *Ridley*, 19 bis.

Pyrenomycetes.

Xylaria Ridleyi, *Massee* (*sp. nov.*). *Capitulum* ellipticum vel obovatum, obtusum, durissimum, crusta fragili pallida tectum, in stipitem cylindricum deorsum abrupte attenuatum. *Perithecia* peripherica, ovata, immersa, ostiolis minutissimis immersis. *Asci* cylindracei, stipitati. *Sporæ* octonæ, oblique monostichæ, elliptico-naviculares, utrinque acutæ, sæpe curvulæ, 18–20 × 4–5 μ, opacæ, brunneæ.

Singapore. On dead wood, Botanic Gardens, *Ridley*, 15.

A very distinct and remarkable species, superficially resembling a stalked fruit. Capitulum broadly ovate or elliptical, obtuse, whitish, glabrous, 1–1·5 × 0·8 — 1 cm., ostiola barely visible under a lens. Stem about equal in length or slightly shorter than the club, 2–3 mm. thick, pale brown. Allied to *Xylaria dealbata*, Berk., but distinguished by the much less prominent ostiola of the perithecia, and the smaller spores.

Rosellinia picacea, *Massee* (*sp. nov.*). *Perithecia* dense gregaria, rarius sparsa, carbonacea, nigra, maculis albo-luteis ornata, ostiolo minuto vix prominulo hiante. *Asci* cylindracei, stipitati, apice subtruncati, octospori, circa 300 × 18 μ. *Sporæ* oblique monostichæ, fuscæ, ellipticæ, utrinque acutæ, 2-guttulatæ, 30 × 15 μ. *Paraphyses* septatæ, capitatæ, filiformes.

Singapore. On dead bark, Botanic Gardens, *Ridley*.

Perithecia 1·5 mm. in diameter, crowded and forming patches 2–3 cm. across. Superficially resembling a species of *Pertusaria*. Allied to *Rosellinia pachydermatica*, Cesati, but quite distinct from this and every other described species in the large spores, distinctly capitate paraphyses, and in the yellowish-white patches on the perithecium, which are sometimes raised above the general level of the surface, and consequently resemble warts.

Xylaria Hypoxylon, *Grev. Flor. Edin.* (1824) p. 355.
Singapore. On dead wood, Botanic Gardens, *Ridley*, 14.

Tryblidiella rufula, *Sacc. Syll.* ii. (1883) p. 757.
Singapore. On dead branches, Botanic Gardens, *Ridley*, 6.

Daldinia vernicosa, *Cesati et De Not. in Comm. Soc. Crittog. Ital.* i. (1863) p. 198.
Singapore. On logs, Botanic Gardens, *Ridley*, 4.

Kertzschmaria Heliscus, *Massee*; *Poronia Heliscus*, Mont. Syll. Crypt. (1856) p. 209.
Singapore. On dead bark, Botanic Gardens, *Ridley*, 7.

The present species is a genuine *Kertzschmaria*, and not a *Poronia*, as is proved by examination of a portion of Montagne's type, sent by him to Berkeley, and now in the Kew Herbarium. The Singapore specimens have the perithecia densely crowded, forming a continuous crust 15–20 cm. long and broad.

Hyphomycetes.

Tubercularia apiospora. *Dur. et Mont. in Expl. Sc. Algér. Crypt.* (1866–69), p. 333.
Singapore. On dead wood, Botanic Gardens.

Necator, *Massee* (*gen. nov.*). *Sporodochia* scutellato-disciformia vel convexiuscula, aurantio-rubra, erumpenti-superficialia, gelatinosa, conidiorum agglutinatorum strato tecta. *Conidia* oblonga vel ellipsoidea, continua, catenulata, demum plus minusve secedentia, plasmate aurantiaco.

A remarkable fungus without very obvious affinities, belonging to the Tuberculariеæ-Mucedineæ, having continuous, brightly-coloured, catenulate conidia. The stroma or sporodochium is distinctly parenchymatous, erumpent and gelatinous, the superficial cells everywhere growing out into chains of conidia; the apical ones being the oldest, and becoming free as they mature, new conidia at the same time forming at the base of the chain.

Necator decretus, *Massee* (*sp. nov.*). *Sporodochia* disciformia, laxe gregaria, sessilia, erumpentia, 1–1·5 mm. diam., interdum oblonga, 2–2·5 × 1·5 mm., alba, dein aurantio-rubescentia. *Conidia* continua, ellipsoidea, catenulata, 14–18 × 7–8 μ.

STATE OF SELANGOR. On cultivated coffee trees.

Said to be a very destructive parasite, attacking the young branches, by commencing at the tips and working downwards. When the pustules first burst through the bark they are white, finally becoming orange-red, due to the formation of the conidia, the epispore of which is smooth and hyaline, but the contents orange-red. The general appearance of the fungus under a pocket-lens, is that of a minute *Dacryomyces* or *Orbilia*. It is said that by removing the injured branches, the spread of the disease is checked.

MYXOGASTRES.

Lycogala Epidendrum, *Rostaf. Monog. Mycet.* (1875) p. 285, t. 1, figs. 1 et 7–12.

SINGAPORE. On dead wood, Botanic Gardens, *Ridley*, 16.

BORNEO.

Fungi from the East Coast of British North Borneo, collected by Mr. C. V. Creagh, C.M.G., late Governor of Labuan.

BASIDIOMYCETES.

Marasmius erumpens, *Massee* (*sp. nov.*). *Pileus* e hemisphærico expansus, membranaceus, glaber, albidus, margine semper subinvolutus, vix 1 mm. latus. *Lamellæ* postice decurrentes, subdistantes, albidæ. *Sporæ* obovatæ, hyalinæ, 5–6 × 4 μ; basidia clavata, 25–30 × 4–5 μ. *Stipes* filiformis, glaber, albidus, basi tuberculo floccoso præditus.

Gregarious on fallen twigs.

Allied to *Marasmius sarmentosus*, Berk., but distinguished by the whitish, glabrous pileus.

Lentinus pergameneus, *Lév. in Ann. Sci. Nat.* sér. 3, v. (1846) p. 117.

On stumps and fallen branches.

The specimens are rather small in size, but possess all the characteristics of the species to which they are referred.

Panus conchatus, *Fries, Epicr.* (1838) p. 398.
Growing on fallen logs.

Polyporus lucidus, *Fries, Syst Myc.* i. (1821) p. 353.
On dead tree-trunks.

Fomes rugosus, *Sacc. Syll.* vi (1888) p. 152.
On dead wood.

Fomes australis, *Sacc. Syll.* vi. (1888) p. 176
On dead wood.

Fomes melanoporoides, *Sacc. Syll.* vi. (1888) p. 196.
On dead wood.

Polystictus membranaceus, *Fries in Nov. Act. Soc. Sci. Upsal.* i. (1851) p. 93.
On dead wood.

Polystictus Xanthopus, *Fries in Nov. Act. Soc. Sci. Upsal.* i. (1851) p. 75.
On dead branches.

British New Guinea.

The species enumerated below were collected by Mr. W. Fitzgerald, and communicated by Sir Ferdinand von Mueller, K.C.M.G., F.R.S., F.L.S.

Basidiomycetes.

Laccaria Hookeri, *Massee; Marasmius Hookeri*, Berk. in Hook. Kew Journ. Bot. iv. (1852) p. 136.
On rotten wood, Amaiama.

Agreeing exactly with Berkeley's type, collected by Dr. (now Sir) J. D. Hooker in Khasia, at an elevation of 6000 ft. The pileus is very tough and pliant when moist, becoming strongly incurved and rigid when dry. Gills broadly annexed, thin, margin entire, 5–8 mm. broad. The present species is a typical member of the genus *Laccaria*, Berk. & Broome, having the gills at maturity powdered with white, globose, warted spores, which measure 7–8 μ in diameter.

Lentinus infundibuliformis, *Berk. et Broome in Journ. Linn. Soc.* xiv. (1875) p. 42.
On rotten wood, Amaiama.

Lentinus brevipes, *Cooke in Grevillea* xiv. (1885) p. 12.
On logs, Kumusi River.

Lentinus Sajor-caju, *Fries, Epicr.* (1838) p. 393.
On rotten wood, Kumusi River.

Lentinus crinitus, *Berk. in Ann. Mag. Nat. Hist.* x. (1842) p. 370.
On rotten wood, Lampotan.

Lentinus pergameneus, *Lév. in Ann. Sci. Nat.* sér. 3, v. (1846) p. 117.
On rotten wood, Kumusi River.

Lentinus exilis, *Klotzsch in Fries Syn. Gen. Lent.* (1836) p. 10.
On rotten wood, Guni Guni.

Lentinus crenulatus, *Massee* (*sp. nov.*). *Pileus* membranaceus, coriaceo-lentus, subreniformis, albidus aut cinnamomeus, tomento albo obductus, sæpe floccosus, margine striatus, 4–5 cm. latus. *Lamellæ* confertissimæ, albidæ, ætate stramineæ, acie lacerato-dentatæ. *Sporæ* ellipticæ, hyalinæ, 7 × 4 μ. *Stipes* tenax, fuscus, 1–2 cm. longus, excentricus.
On rotten branches, Samarai.
Allied to *Lentinus flabelliformis*, Fries, but distinguished by the crowded gills and elliptical spores.

Schizophyllum commune, *Fries, Syst. Myc.* i. (1821) p. 330.
On a rotten trunk, Dogura.

Polyporus betulinus, *Fries, Syst. Myc.* i. (1821) p. 358.
On trunks, Samarai.

Polyporus auberianus, *Mont. in La Sagra, Hist. Ile Cuba, Crypt.*, (1838–42) p. 399.
On rotten wood, Medan.

Fomes incrassatus, *Sacc. Syll.* vi. (1888) p. 205.
On logs, Malama River.
This species has been previously collected in New Guinea by Armit.

Fomes senex, *Sacc. Syll.* vi. (1888) p. 164.
On logs, Jimari.

Fomes conchatus, *Gill. Hymén.* (1874) p. 658.
On dead wood, Kumusi River.
The specimens agree exactly with the Australian form of this species, being altogether smaller than the typical European form, but at the same time not differing in any essential features.

Fomes Curreyi, *Sacc. Syll.* vi. (1888) p. 195; *Polyporus xerophyllaceus*, Curr. in Trans. Linn. Soc. ser. 2, i. (1876) p. 124 (non Berk.).
On logs, Jimari.

Polystictus Xanthopus, *Fries in Nov. Act. Soc. Sci. Upsal.* i. (1851) p. 74.
On rotten wood, Medan.

Polystictus nephridius, *Sacc. Syll.* vi. (1888) p. 219.
On logs, Kumusi River.

Polystictus affinis, *Fries in Nov. Act. Soc. Sci. Upsal.* i. (1851) p. 75.
On fallen trunks, Kumusi River.

Polystictus ochrotinctus, *Sacc. Syll.* vi. (1888) p. 225.
On dead wood, Kumusi River.

Polystictus submembranaceus, *Sacc. Syll.* vi. (1888) p. 288.
On dead branches, Kumusi River.

Polystictus sanguineus, *Fries, in Nov. Act. Soc. Sci. Upsal.* i. (1851) p. 75.
On decayed trunks and stumps, Kumusi River.

Polystictus Persoonii, *Sacc. Syll.* vi. (1888) p. 272.
On decayed trunks, Kumusi River.

A very variable species; sometimes effused and closely adnate without the slightest trace of a free or reflexed margin; such patches vary from 6 inches to 2 feet in length, and judging from the appearance of herbarium specimens, are sometimes still larger when growing. In other specimens, the greater portion of the fungus is resupinate, the margin alone being free and more or less reflexed. Finally, there is every stage of transition shown by this species, from the typical *Poria*, or resupinate form, to the equally typical *Polystictus* form, growing horizontally, and attached to the matrix by a narrow base. The dark red cuticle usually peels off and disappears as the fungus becomes old, commencing at the margin of the pileus, and producing a very characteristic appearance.

Polystictus obliquus, *Massee* (*sp. nov.*). *Pileus* tenuis, coriaceus, applanatus, late obovatus, velutinus, dein glabrescens, concentrice sulcatus, pallidus, nitens, dein fulvescens, azonus, 1 cm. latus. *Pori* minutissimi, rotundati. *Sporæ* subglobosæ, flavidæ, 5 μ. *Stipes* lateralis, concolor, interdum basi fuscescens, 4–5 mm. longus crassusque.

On decayed wood, Kumusi River.

Allied to *Polyporus spathulatus*, Berk., but distinguished by the silky or tomentose pileus.

Poria mellea, *Sacc. Syll.* vi. (1888) p. 317.
On rotten wood, Samarai.

Hexagonia tenuis, *Fries, Epicr.* (1838) p. 498.
On dead wood, Mulama.

Trametes lactinea, *Berk. in Grevillea* i. (1872) p. 66.
On dead wood, Wamira.

Dædalea glaberrima, *Berk. et Curt. in Grevillea* i. (1872) p. 67.

On dead wood, Samarai.

Laschia tremellosa, *Fries, Summa Veg. Scand.* (1846) p. 325.
On decayed wood, Samarai.

Cladoderris dendritica, *Fries in Vet. Akad. Handl. Stockh.* (1848) p. 142.

On dead wood, Kumusi River.

Stereum cyathiforme, *Fries, Epicr.* (1836) p. 55.
On dead wood, Kumusi River.

Stereum pergameneum, *Berk. et Curt. in Grevillea* i. (1873) p. 161.

On dead wood, Kumusi River.

The present species has only been recorded previously from the United States and Brazil.

Stereum fasciatum, *Fries, Epicr.* (1838) p. 546.
On rotten logs, Kumusi River.

Stereum versicolor, *Fries, Epicr.* (1838) p. 547.
On dead wood, Amaiama.

Stereum complicatum, *Fries, Epicr.* (1838) p. 548.
On dead branches, Amaiama.

Hymenochæte leonina, *Berk. et Curt. in Journ. Linn. Soc.* x. (1869), p. 334.
On dead wood, Samarai.

Hirneola polytricha, *Fries in Vet. Akad. Handl. Stockh.* (1848) p. 146.
On dead branches, Samarai.

Guepinia spathularia, *Fries*, *Elenchus* ii. (1828) p. 32.
On dead wood, Samarai.

Ascomycetes.

Xylaria scopiformis, *Sacc. Syll.* i. (1882) p. 340.
On dead wood, Samarai.

Geopyxis elata, *Massee* (*sp. nov.*). *Ascomata* stipitata, cupulata, extus intusque alutacea, rugulosa, glabra, 2 cm. lata. *Stipes* longissimus, cylindraceus, glaber, pallidus, 6–8 cm. longus, 3–4 mm. crassus. *Asci* cylindraceo-pedicellati, octospori, iodo haud tincti, 320–350 × 18–20 μ. *Sporæ* elliptico-fusoideæ, utrinque acuminatæ, hyalinæ, 32–35 × 14–15 μ. *Paraphyses* filiformes.
On the ground, Kumusi River.
Hypothecium and excipulum formed of slender, interwoven hyphæ, which pass into a small-celled parenchymatous cortex. Allied to *Geopyxis aluticolor*, Berk., but distinguished by the much longer stem, larger spores, and by growing on the ground.

Chætomium comatum, *Fries*, *Syst. Myc.* iii. (1829) p. 253.
On dead stems of grass, Kumusi River.

Western Australia.

Fungi collected by Miss Egerton-Warburton, and communicated by Sir Ferdinand von Mueller, K.C.M.G., F.R.S., F.L.S.

Basidiomycetes.

Lepiota Lavendulæ, *Sacc. Syll.* ix. (1891) p. 9.
On the ground, Gordon River.

Collybia olivaceo-alba, *Sacc. Syll.* ix. (1891) p. 28.
On the ground, Gordon River.

Lentinus dealbatus, *Fries in Lehm. Pl. Preiss.* ii. (1846–47) p. 133.
On dead wood, Gordon River.

Flammula flavida, *Karst. Ryss. Finl. Hattsv.* (1879) p. 406.
On logs, Gordon River.

Flammula sapinea, *Karst. Ryss. Finl. Hattsv.* (1879) p. 410.
On the ground, Gordon River.

Flammula fusa, *Karst. Ryss. Finl. Hattsv.* (1879) p. 405.
On wood, Gordon River.

Polysaccum microcarpum, *Cooke et Mass. in Grevillea* xvi. (1887) p. 28.
On the ground, Gordon River.

Tasmania.

The following collection, remarkably rich in new and interesting hypogeous species, was referred to Kew for determination by Mr. L. Rodway, of Hobart, Tasmania. Coloured figures of the Basidiomycetes were sent with the specimens.

Basidiomycetes.

Clitocybe lilacina, *Massee* (*sp. nov.*). *Pileus* carnosulus, cyathiformis, margine primo involutus, levis, glaber, pallide violaceus, expallescens, 2–4 cm. latus. *Lamellæ* confertæ, latæ, attenuato-decurrentes, lilacinæ. *Sporæ* ellipsoideæ vel obovatæ, hyalinæ, 7–8 × 5 μ; basidia clavata, 40 × 7–8 μ. *Stipes* æqualis, solidus, subfibrillosus, lilacinus, apice albus furfuraceusque, 5–7 cm. longus.

On the ground, near Hobart, *Rodway*, 54.

A remarkably fine species, superficially resembling the amethyst-coloured form of *Clitocybe laccata*, Fries (*Laccaria laccata*, Berk. & Broome) but differing in the smooth, elliptical spores, and the deeply decurrent gills. *Clitocybe porphyrella*, Berk. & Curt., a North American species, also possesses some points in common with the fungus under consideration, but differs distinctly in having adnate gills.

Russula coccinea, *Massee* (*sp. nov.*). *Pileus* carnosulus, e convexo explanatus depressusve, mox siccus, margine exoletus substriatus, læte coccineus, epidermide separabili, 3–5 cm. latus. *Caro* alba, mitis. *Lamellæ* postice attenuato-annexæ, latæ, æquales, raro subfurcatæ, albidæ, ætate omnino aut tantum hinc inde ochraceo-fuscatæ. *Sporæ* sphæroideæ, eximie verruculosæ, hyalinæ, 11–12 μ; basidia clavata, 21–24 × 9–10 μ. *Stipes* spongioso-farctus, dein lacunosa-cavus, basi subincrassatus, subrugulosus, albus, 3–5 cm. longus.

On the ground, Hobart, *Rodway*, 296.

Distinguished from all known species by the following combination of characters. Taste mild; pileus light to dark crimson; gills and stem white. It has some superficial resemblance to *Russula fragilis*, Fries, which, however, differs in its extreme fragility, acrid taste, and forked gills.

Russula purpurea, *Gillet*, *Tab. Analyt.* (1884) p. 47.
On the ground, near Hobart, *Rodway*, 68.

Identical with the species as described by Gillet, from French specimens.

Lactarius subdulcis, *Fries*, *Epicr.* (1838) p. 345.
On the ground, near Hobart, *Rodway*, 34.

Agreeing with the typical European form.

Leptonia Rodwayi, *Massee* (*sp. nov.*). *Pileus* membranaceus, convexo-explanatus, profunde umbilicatus, margine subundulatus, estriatus, obscure cæsio-virens, squamulosus, siccitate pallescens, 2–3 cm. latus. *Lamellæ* adnatæ, postice sinuato-uncinatæ, latæ, subdistantes, pallidæ. *Sporæ* valde irregulares, roseæ, 8–10 × 7 μ. *Stipes* subfistulosus, flexuosus, fibrillosus, viridi-olivaceus vel luteo-virens.

On the ground, near Hobart, *Rodway*, 47.

Solitary. Pileus dark green, rather satiny, minutely squamulose. Allied to *Leptonia lampropoda*, Fries, and *L. serrulata*, Pers., but differing from both in the dark green colour of the pileus and stem.

Nidularia fusispora, *Massee* (*sp. nov.*). *Peridia* gregaria, haud confluentia, alba, tuberculosa, nudo oculo glabra, tenuissima, tandem undique disrupta et evanescentia. *Sporangiola* numerosa, discoidea, muco copioso involuta, flavo-brunnea, 0·5 mm. lata. *Sporæ* ellipsoideæ, utrinque acutæ, hyalinæ, 9–12 × 4–4·5 μ.

On rotten wood, gully off Huon Road, *Rodway*, 345.

A minute species, 1–4 mm. in diameter; peridium very delicate, silvery-white, evanescent. It belongs to the section *Sorosia* of Tulasne, characterized by the presence of filaments mixed with the spores. The four known species are imperfectly described; only in one instance is any mention made of the spores, hence the nearest affinity of the present species is uncertain.

Ascomycetes.

Gymnomyces, *Mass. et Rodw.* (*gen. nov.*). *Peridium* haud distinctum vel nullum. *Gleba* carnosa, ad basin fertilis, extus intusque lacunosa, cellulis cavis ubique subæqualibus; septa haud scissilia. *Basidia* plerumque 2-spora. *Sporæ* globosæ, hyalinæ, echinulatæ vel verrucosæ.

Differs from *Gautieria* in the hyaline, globose spores. Some species of *Octaviania*, in which the peridium is very delicate, bear some resemblance to the species included in the present genus, but are distinguished by the well developed, sterile base and the tinted spores.

Gymnomyces pallidus, *Mass. et Rodw.* (*sp. nov.*). *Gleba* globosa, irregularis, initio albida, dein sordida, cellulis majusculis irregularibus sordide albidis; septa tenuia, albida, nec scissilia. *Sporæ* globosæ, 9–10 μ diam., hyalinæ, verruculosæ, sæpe brevissime caudatæ, in quoque basidio binæ, sterigmatibus brevibus suffultæ.

Underground, *Rodway*, 299.

Irregularly spherical, 2–4 cm. in diameter, very fragile, no distinct peridium. Sterile base obsolete, but in one specimen growing into a slender stem emerging from an umbilicus.

Gymnomyces seminudus, *Mass. et Rodw.* (*sp. nov.*). *Gleba* globosa, albida, extus laxe tomentosa, 1·5–2·5 cm. lata, cellulis minutis creberrimis vacuis irregularibus; septa crassiuscula, albida, nec scissilia. *Basidia* subclavata, 2-sterigmatica. *Sporæ* sphæricæ, 11–12 μ diam., creberrime echinatæ, hyalinæ.

Emerging from the ground, *Rodway*, 124.

There is a delicate external downiness or silkiness, which may be considered as a very rudimentary peridium. There is no trace of a sterile base, which, along with the hyaline spores, separates this fungus from those species of *Octaviania* in which the peridium is slight. Distinguished from *G. pallidus*, Mass. & Rodw., by the larger, strongly and densely echinulate spores.

Genabea tasmanica, *Mass. et Rodw.* (*sp. nov.*). *Peridium* subglobosum, tuberculosum, undique anfractuosum, absque basi propria cortice minutissime granulatum vel rugulosum brunneum. *Gleba* pallida, subimmutabilis, sparsim cellulosa, nigro-punctata.

Asci obovati vel oblongi, obtusi, 70–90 × 45–50 μ, 2–4-spori. *Sporæ* varie dispositæ, late ellipsoideæ, utrinque acutæ, leves, inæquilaterales, 30–35 × 16–20 μ, maturæ brunneo-nigræ, subopacæ, nitentes, utraque guttulam mediam crassam includens.

Underground, in sandy soil, *Rodway*, 119.

A very fine and distinct species, 1·5–2·5 cm. in diameter, remarkable for the very large lemon-shaped spores, which are quite smooth, clear brown, and translucent when young, finally becoming blackish-brown and opaque. When quite young the asci are almost globose, then pyriform or obovate, and finally more or less oblong with age, the arrangement of the spores varying with the form of the ascus. Wall of ascus thick except at one point at the apex; it does not turn blue with iodine. Substance of the gleba consisting entirely of hyaline, sparsely septate, thin-walled, intricately interwoven hyphæ. Not closely allied to any described species.

Hymenogaster Rodwayi, *Massee* (*sp. nov.*). *Peridium* globoso-difforme, sat irregulare, carnosulum, sericeum, albidum, demum lutescens. *Gleba* firma, compacta, demum obscure brunnea, cellulis minutis irregularibus e basi sterili ad peripheriam obscure directis. *Basidia* clavata, 2-sterigmatica, sterigmatibus brevibus 40 × 7–8 μ. *Sporæ* ellipticæ vel limoniformes, apice apiculatæ, basi subtruncatæ, longitudinaliter rugulosæ vel carinatæ, initio ochraceæ, dein flavo-brunneæ, 20 × 10–12 μ.

Among buried twigs, Hobart, *Rodway*, 116.

Growing underground, irregular, 2–3 cm. in diameter, white, becoming dingy yellow when dry. Peridium very distinct. Gleba compact, cavities small, irregular in form, showing an indistinct tendency to radiate from the sterile base towards the periphery of the fungus. Sterile base conspicuous, and giving off branching veins penetrating the gleba, which becomes dark brown at maturity. Basidia usually with two sterigmata, sometimes however only a single sterigma is present. Spores elliptical or lemon-shaped, apex apiculate, base slightly truncate at the point corresponding to the attachment of the sterigma: longitudinally ribbed, ribs simple, or forked and anastomosing, strong, converging at the ends.

Most nearly approaching *H. decorus*, Tul.; the latter however differs in the violet tinge of the gleba, the narrow basidia, very inconspicuous sterile base, and larger spores, which lack the strong longitudinal ribs ornamenting the epispore of the present species.

Hymenogaster albellus, *Mass. et Rodw.* (*sp. nov.*). *Peridium* globosum, irregulare, subglabrum, album, demum pallidum, tenuissimum, nec separabile. *Gleba* pallide brunnea, firmula, cellulis majusculis e pulvinulo basilari sterili minuto albido subradiantibus. *Basidia* clavata, haud raro furcata vel irregularia, 1–4-, plerumque 2-, sterigmatica, sterigmatibus longiusculis. *Sporæ* elliptico-fusiformes vel citriformes, vulgo utrinque apiculatæ, flavæ, maturitate flavo-brunneæ, verruculosæ 16–17 × 8–9 μ.

Subterranean, *Rodway*, 117.

Irregularly subglobose, white, 2–3 cm. in diameter. Most closely allied to *H. tener*, Berk., but readily distinguished by the larger cavities of the gleba, much less conspicuous sterile base, and the

distinctly although very minutely warted spores. *H. Klotzschii*, Tul., also presents affinities with the present species, but differs in the obtuse, glabrous spores.

Hymenogaster violaceus, *Mass. et Rodw.* (*sp. nov.*). *Peridium* globosum, sat irregulare, lilacino-fuscum, dein violaceum, viscidum, tenue, in gleba innatum, sericeum. *Gleba* subelastica, initio tota albida, dein brunnea, cellulis tortuosis majusculis creberrimis basi sterili glebæ minutis; septa tenuia. *Basidia* angusta, subflexuosa, 2-sterigmatica, sterigmatibus longiusculis acutis. *Sporæ* globoso-ellipticæ, obtusæ, verruculosæ, 9 × 7 μ, initio ochraceæ, dein fuscæ.

Subterranean, or emerging from the ground, *Rodway*, 297.

Irregularly subglobose, 2–3 cm. in diameter. Allied to *Hymenogaster lilacinus*, Tul., and *H. decorus*, Tul.; differing from the former in the viscid, violet peridium and warted spores; and from the latter in the absence of a violet or purple tinge in the gleba, and the much smaller spores.

Hysterangium viscidum, *Mass. et Rodw.* (*sp. nov.*). *Peridium* irregulare, oblongum, extus castaneum, viscidum, 3 × 1·5 cm., facile a gleba separabile, elasticum, cellulis e basi radiantibus irregularibus minutis; septa crassa, brunnea, non scissilia. *Sporæ* oblongo-ellipticæ, utrinque obtusatæ, 14–15 × 10 μ, 3–4 in quoque basidio, papillatæ, flavo-brunneæ, pellucidæ, vel in massis visæ sordide brunneæ.

Underground, near Hobart, *Rodway*, 270.

Readily distinguished in the genus by the chocolate-brown, viscid peridium, and the elliptic-oblong, obtuse spores.

Hysterangium fusisporum, *Mass. et Rodw.* (*sp. nov.*). *Peridium* subglobosum, irregulare, leve, albidum, tenuissimum, nec a gleba separabile, extus albidum flavo-maculatum, intus albidum. *Gleba* firma, pallida, cellulis exiguis irregularibus sinuosis absque basi sterili vix conspicuis. *Sporæ* fusiformes, leves, 20–22 × 8 μ, in quoque basidio binæ, sterigmatibus brevibus suffultæ, hyalinæ.

Growing underground, *Rodway*, 276.

A distinct species, irregularly subglobose, 1·5–2 cm. in diameter. Allied to *H. membranaceum*, Vittad., and to the following species, but readily distinguished from either by the larger, distinctly fusiform, hyaline spores, acute at both ends.

Hysterangium affine, *Mass et Rodw.* (*sp. nov.*). *Peridium* subglobosum, basi fibrillis radicalibus instructum, supra nudum, crassum, extus pallide fuscum, fibrillosum, intus candidum, a gleba facile secedens. *Gleba* matura gelatinoso-elastica, prima ætate sordide viridis, dein obscure grisea, cellulis difformibus gyrosis creberrimis minutis. *Basidia* oblongo-subclavata, 40 × 8 μ, plerumque tetraspora, sterigmatibus brevibus. *Sporæ* ellipsoideo-oblongæ, utrinque obtusatæ, leves, pallide glauco-virescentes, 11–13 × 5–6 μ.

McRobie's Gully, Hobart, *Rodway*, 123.

A very fine species, subglobose, 1–2 cm. in diameter, collected in abundance at the locality given above, by Mr. Rodway. Occupying a position intermediate between *H. clathroides*, Vittad., and *H. membranaceum*, Vittad., but quite distinct from either. Distinguished from the first named in the presence of well developed, persistent

rooting fibres, and the absence of a broadly effused, pure white mycelium; and from *H. membranaceum*, Vittad., in the thick. glabrous peridium, and the very slight indication of a sterile base,

The basidia are most frequently tetrasporous, but a few bisporous basidia are present. The sterigmata are very short.

Hysterangium clathroides, *Vittad. Monog. Tuber.* (1831) p. 13, t. 4, fig. 2.

Subterranean, *Rodway*, 265.

Hysterangium membranaceum, *Vittad. Monog. Tuber.* (1831) p. 14, t. 4, fig. 15.

Closely allied to *H. affine*, Mass. & Rodw., but distinguished by the membranaceous, dry, subtomentose, white peridium, which, like the gleba, becomes tinged with indigo or green when bruised.

Underground, Hobart, *Rodway*, 288.

Hydnangium australiense, *Berk. et Broome in Trans. Linn. Soc.* ser. 2, ii. (1883) p. 64; *Octaviania australiensis*, Cooke, Handb. Austr. Fung. (1892) p. 246.

Subterranean, *Rodway*, 20. Also known from Victoria.

Emerging from the ground; when freshly cut milk-bearing. Irregularly reniform, 1·5–2 cm. in diameter, rufous-brown. Gleba rather compact, paler; sterile base small or none, peridium distinct, continuous. Spores hyaline, globose, very minutely and sparsely verruculose, 10–13 μ in diameter. Basidia clavate, bisporous or rarely monosporous, sterigmata elongated.

The Tasmanian specimens agree perfectly with Berkeley's type of the species.

Hydnangium carneum, *Wallr. in Dietr. Fl. Boruss.* (1838) t. 465.

Underground, *Rodway*, 118. Widely distributed; there are specimens in the Kew Herbarium from the following countries: England, Scotland, France, Germany, Silesia, Italy, Sweden, Finland, and Australia.

Irregular, 2–3 cm. in diameter, smooth, pale pink. Peridium very thin. Gleba rather friable, pink; cavities tortuous, rather large; sterile base very distinct, sometimes sending strands through the gleba. Basidia narrowly cylindric-clavate, with two long, tapering sterigmata, rarely only one sterigma is present. Spores globose, hispid with crowded, slender spines, 2–3 μ long, hyaline, 13–18 μ in diameter.

Allied to *H. australiense*, Berk. & Broome, but readily distinguished by the pink tinge of the peridium and gleba, and the more distinctly spinulose spores.

Hydnocystis cyclospora, *Massee; Berggrenia aurantiaca*, var. *cyclospora*, Cooke, in Grevillea xv. (1886) p. 16; *Hydnocystis convoluta*, McAlpine, in Agric. Gaz. N. S. Wales vii. (1896) p. 86.

Rodway; and also New Zealand, *Colenso.*

Cooke states that the spores of var. *cyclospora* measure 18 μ in diameter but an examination of the type specimen proves that the spores range from 9–12 μ in diameter.

Meliola amphitricha, *Mont. in La Sagra, Hist. Ile Cuba, Crypt.*, (1838–42) p. 326.

On a dead leaf of *Olearia argophylla*, F. Muell., *Rodway*, 472.

Meliola corallina, *Mont. in Gay, Fl. Chil.* vii. (1850) p. 472.
On living leaves of *Cyathodes glauca*, Labill., and *Pomaderris apetala*, Labill., *Rodway*, 366, 421.

Xylaria digitata, *Grev. Flor. Edin.* (1824) p. 355.
On the ground on sandy heaths, Hobart, *Rodway*.
A peculiar form of this variable species, with a long, rooting, stem-like base pushing deep down into the loose sand, and bearing a rosette of short, obtuse, finger-like, equal branches at the apex.

Nummularia Bulliardi, *Tul. Sel. Fung. Carp.* ii. (1863) p. 43, t. 5, figs. 11–19.
On dead bark of *Acacia dealbata*, Link, *Rodway*, 465.

Hypoxylon annulatum, *Mont. in Gay, Fl. Chil.* vii. (1850) p. 445.
On dead wood of *Fagus Cunninghami*, Hook., Hobart, *Rodway*, 184.
Very fine specimens of this somewhat variable species. The depression round the ostiolum is very pronounced.

Hypoxylon cœlatum, *Cesati, Myc. Born.* (1879) p. 19.
On dead *Eucalyptus* wood, *Rodway*, 310, 453.
Agrees exactly with specimens collected by Beccari in Borneo.

Hypoxylon serpens, *Fries, Summa Veg. Scand.* (1846) p. 384.
On dead *Eucalyptus* wood, *Rodway*, 181.

Hypoxylon multiforme, *Fries, Summa Veg. Scand.* (1846) p. 384.
On dead bark of *Acacia dealbata*, Link, *Rodway*, 454.

Hypoxylon Archeri, *Berk. in Hook. f. Fl. Tasm.* ii. (1860) p. 280.
On dead *Eucalyptus* wood, *Rodway*, 451.
Agrees exactly with Berkeley's type specimen. There is a minute, smooth, depressed ring or zone round the very small, papillate ostiolum, as in *Hypoxylon annulatum*, Mont., but in *H. Archeri*, the perithecia are much smaller, as is also the ring round the ostiolum.

Eutypa lata, *Tul. Sel. Fung. Carp.* ii. (1863) p. 56.
On dead *Eucalyptus* bark, *Rodway*, 466.

Dimerosporium tasmanicum, *Massee* (*sp. nov.*). *Perithecia* gregaria, mycelio maculiformi atro erumpentia, sphæroidea, astoma, setosa, fusca atrave, 80–100 μ lata. *Asci* cylindraceo-clavati, breviter pedicellati, octospori, 80–90 × 15–18 μ. *Sporæ* distichæ, oblongo-ellipticæ, medio 1-septatæ, utrinque rotundatæ, 18–20 × 8–9 μ, dilute olivaceo-fuscæ. *Paraphyses* filiformes, ramosæ.
On one surface only of the phyllodes of *Phyllocladus rhomboidalis*, Rich., *Rodway*, 367.
The perithecia have short, black, spine-like hairs scattered sparingly over the entire surface. Subiculum at times dense and more or less covering the entire surface of the leaf, at others almost or entirely absent. Perithecia in groups of 3–6 usually surrounding a central one. Allied to *D. excelsum*, Cooke, from New Zealand, but differing in the larger spores and pilose perithecia.

Rosellinia mammoidea, *Sacc. Syll.* i. (1882) p. 263 ; *Psilosphæria mammoidea*, Cooke in Grevillea viii. (1879) p. 67.

On dead wood of *Eucalyptus*, *Rodway*, 271. The type was collected in New Zealand.

A very fine species. The perithecia are sometimes so closely crowded as to become somewhat irregular from lateral pressure, and to suggest an affinity with the genus *Hypoxylon*. The perithecia are just a little more depressed round the papillate ostiolum than in the typical form, otherwise there is no difference.

Gibbera fulvella, *Massee* (*sp. nov.*). *Stroma* pulvinatum, suberumpens, 1–2 mm. latum. *Perithecia* tuberculato-prominula, fulvo-miniata, dein brunneo-atra, glabra, ostiolo vix visibile. *Asci* oblongo-ovati, 35–40 × 8–10 μ. *Sporæ* distichæ, ellipticæ, hyalinæ, medio 1-septatæ, utrinque subacutæ, 18–20 × 4–4·5 μ.

On living leaves of *Dillwynia cinerascens*, R. Br., *Rodway*, 355.

Elliptic-oblong, pale brown, 1-septate conidia, measuring 18–21 × 4–5 μ, are sometimes present in considerable numbers on the stroma. The leaves of the host are stunted by the fungus.

Quaternaria aspera, *Massee* (*sp. nov.*). *Stroma* suberumpens, corticolum, effusum, scabrosum. *Perithecia* subglobosa, ostiolo prominula, subcutaneo-erumpentia. *Asci* cylindraceo-clavati, longissime stipitati, 180 × 8 μ, octospori. *Sporæ* distichæ, cylindraceo-curvatæ, utrinque obtusatæ, pallide fusco-olivaceæ, 10–12 × 3–3·5 μ.

On the bark of *Pomaderris apetala*, Labill., *Rodway*, 488.

Only a small specimen was sent, and this did not show the margin of the fungus, which appears to form broadly-effused, scabrid patches on the branches.

Byssosphæria Aquila, *Cooke*, *Handb. Austr. Fung.* (1892) p. 304, t. 24, fig. 219.

On decaying *Eucalyptus* wood, *Rodway*, 452.

The dense subiculum has a purple tinge, but in all important features the fungus is indistinguishable from European specimens.

Zignoella Archeri, *Sacc. Syll.* ii. (1883) p. 217.
On rotten wood, *Rodway*, 499.

Hypomyces fulgens, *Karst. Myc. Fenn.* ii. (1873) p. 207.
On rotting wood, *Rodway*, 493.

The perithecia vary from very pale yellow to orange, the ostiola usually darker in colour; otherwise as in Karsten's specimens.

Hypocrea nebulosa, *Massee* (*sp. nov.*). *Stroma* effusum, tomentosum, lutescens, ostiolis peritheciorum crebre punctatum. *Perithecia* minuta, subglobosa. *Asci* cylindracei, 60–70 × 8 μ. *Sporæ* octonæ, biloculares, hyalinæ, 10 × 6 μ, loculis mox secedentibus.

On a dead *Polyporus*, *Rodway*, 484.

A very distinct and remarkable species, in some respects intermediate between the genera *Hypomyces* and *Hypocrea*. Agreeing with the former in the somewhat byssoid and mealy, thin subiculum in which the numerous perithecia are completely immersed, but conforming with *Hypocrea* in the narrowly cylindrical asci containing eight spores, each of which divides into two portions at an early stage of development, thus presenting the appearance

of an ascus containing sixteen spores. The present species agrees most closely with *Hypocrea citrina*, Fries, but differs in the thinner, byssoid stroma and shorter asci. *Hypocrea fungicola*, Karst., which also occurs on old specimens of *Polyporus* and other fungi, differs in the thicker, waxy, yellow stroma.

Mitrula cucullata, *Fries*, *Epicr.* (1838) p. 584.
On small twigs of *Eucalyptus urnigera*, Hook. f., *Rodway*, 433.

The occurrence of the perfectly typical form of this fungus growing on *Eucalyptus* twigs is interesting, as hitherto it has only been met with on dead leaves of conifers. This circumstance serves to corroborate what has been previously stated respecting the value of the host as a specific factor, and may serve to modify the views of those who, on the ground that they depend on particular species of conifers, have attempted to discriminate between the European species of *Mitrula*.

Peziza vesiculosa, *Bull. Champ. Fr.* (1791) p. 270, t. 457, fig. 1.
Forma glabrata. *Ascoma* extus pallide brunneum vix granulosum. *Hymenium* obscure brunneum.

On rich ground, manure, etc., *Rodway*, 23.

Differing from the typical form in the dark brown disc, and paler, almost even and glabrous exterior. This form has also been received from Victoria (*Mrs. Martin*).

Patellaria Maura, *Massee* (*sp. nov.*). *Ascomata* gregaria, sessilia, concaviuscula, dein planiuscula, virenti-atra, sicca tota nigra, 1–2 cm. lata. *Asci* clavati, basi parum constricti, octospori, iodo operculo cœruleo-tincti, 150 × 10 μ. *Sporæ* distichæ, ellipsoideo-oblongatæ, 3–6-, plerumque 5-, septatæ, hyalinæ, 18–22 × 5 μ. *Paraphyses* filiformes, ramosæ, apice subincrassatæ, 2 mm. latæ.

On dead branches of *Acacia verniciflua*, A. Cunn., Hobart, *Rodway*, 467.

Allied to *P. tasmanica*, Berk., but distinguished by the larger size of the ascophore, also by the longer, septate spores. The hypothecium and excipulum consist of slender interwoven hyphæ.

Aleurina tasmanica, *Massee* (*sp. nov.*). *Ascomata* gregaria, carnosa, subsessilia vel subradicato-producta, ex hemisphærico expansa, extus saturate brunnea, verrucosa, 2–3 cm. lata, hymenio flavo-brunneo depallente. *Asci* cylindraceo-pedicellati, iodo haud tincti, 300–325 × 18–20 μ. *Sporæ* late ellipticæ, utrinque obtusatæ, episporio verruculosæ, flavo-brunneæ, 26–30 × 13–15 μ. *Paraphyses* septatæ, apice clavato, succineo-farctæ, 4–5 mm. crassæ.

On the ground, Hobart, *Rodway*, 128.

Distinguished from all described species by the warted exterior of the ascophore, and the large spores with a somewhat coarsely warted epispore.

Sphæropsideæ.

Libertella aurantiaca, *Massee* (*sp. nov.*). *Acervuli* flavidi, difformes, diu epidermide velati, tandem in cirrhos tortuosos auranticolores erumpentes. *Conidia* filiformi-falcata, continua, hyalina, 5–7 × 1·5 μ.

On dead *Eucalyptus* wood, *Rodway*, 504.

The masses of spores are buried in the substance of the wood or bark, and ooze out in bright orange, variously contorted, gelatinous tendrils, which become rigid and brittle when dry. Indistinguishable from *Libertella faginea*, Desm., to the naked eye, but readily distinguished under the microscope by the much smaller, almost or sometimes quite straight spores.

Stagonospora chalybea, *Massee* (*sp. nov.*). *Perithecia* dense gregaria, suberumpentia, subrotunda, levia, astoma, nigra, circiter 0·5 mm. diam., contexta distincte parenchymatica chalybeo-purpurea. *Basidia* filiformia. *Sporulæ* oblongo-cylindraceæ, utrinque subattenuatæ, 24–28 × 7–9 μ, rectæ curvulæve, 1–3-septatæ.

On dead bark of *Eucalyptus*, *Rodway*, 440.

Distinguished by the large, aggregated perithecia, large celled parenchyma of a clear, intense blue or purplish-blue colour, and the large 3-septate spores. May possibly prove to be the pycnidial condition of an ascigerous fungus belonging to the genus *Gibberella*.

Myxogastres.

Trichia fragilis, *Rostaf. Monog. Myc.* (1875) p. 246.
On dead bark, *Rodway*, 452.

New Zealand.

Specimens communicated by the Rev. William Colenso, F.R.S., Napier, New Zealand.

Basidiomycetes.

Marasmius tinctorius, *Massee* (*sp. nov.*). *Pileus* coriaceo-membranaceus, conico-convexus, demum explanatus, late umbonatus, glaber, levis, croceo-fuscus, margine primitus incurvo, 0·5–1 cm. latus. *Lamellæ* in juventute sat confertæ, tandem subdistantes, initio albæ, dein flavæ, utrinque rotundatæ. *Sporæ* ellipsoideæ, albo-flavidæ, 5 × 3 μ. *Stipes* æqualis, levis vel subtiliter striatus, strictus, 1–1·5 cm. longus, 2 mm. crassus, pileo concolor.

Gregarious, on a rotten log, *Colenso*, 1489.

Every part of the plant has a yellow tinge, and when soaked in water or spirit, gives out a yellow colouring matter. Allied in some respects to *M. ferrugineus*, Berk., but differing in the even pileus and crowded gills.

Hypholoma glutinosum, *Massee* (*sp. nov.*). *Pileus* carnosus, convexo-planus, discoideus, sæpe subgibbosus, albo-luteus, disco castaneus, squamis maculiformibus appressis concoloribus, præcipue in juventute eleganter variegatus, ætate glabrescens, viscidus, 4–9 cm. latus. *Lamellæ* adnatæ, confertæ, flavo-viridescentes, acie subcrenulatæ. *Sporæ* oblongo-ellipticæ, utrinque obtusæ, viridi-fuscæ, 7–8 × 4–5 μ. *Stipes* farctus, dein cavus, fibrillosus, carne flavus.

In clusters on logs, Dannevirke, *Colenso*, 1507.

A fine species, much resembling *H. sublateritium*, Sacc., in general appearance, but distinguished by the viscid or glutinous pileus, which is ornamented, especially when young, with tawny, floccose scales. If the gluten is washed off with rain the pileus is naked and glabrous at maturity, but if the viscidity dries on the pileus the scales are also glued down and persist. The taste is slightly acrid when dry.

Ascomycetes.

Parodiella maculata, *Massee* (*sp. nov.*). *Perithecia* dense gregaria, in maculis elongatis nigricantibus nidulantia, atra, 100–125 μ diam. *Asci* oblongo-clavati, breviter pedicellati, octospori, 50×14 μ. *Sporæ* distinctæ, 1-septatæ, sub-hyalinæ, elongato-ellipticæ, utrinque acutæ, 20×5–6 μ. *Paraphyses* filiformes.

On the leaf of an undetermined plant, *Colenso*, 1496.

A typical *Parodiella* in every respect save the subhyaline spores, and in this one feature is distinct from all known species.

Nubia.

Collected and communicated by the late Mr. J. Theodore Bent, F.R.G.S.

Ustilagineæ.

Ustilago Digitariæ, *Rabenh. Fung. Eur.* no. 1199.
Parasitic on *Panicum Teneriffæ*, R. Br., distorting the ovary.

Bermuda.

Specimens communicated by Surg.-Capt. H. A. Cummins, F.L.S.

Phycomycetes.

Peronospora Lamii, *De Bary in Rabenh. Herb. Myc.* ed. 2, no. 325.

St. George's. On living leaves of *Lamium amplexicaule*, Linn.

Sphæropsideæ.

Epiclinium Cumminsii, *Massee* (*sp. nov.*). *Sporodochia* atra, dense aggregata, erumpenti-superficialia, convexo-pulvinata, circa 0·5 mm. diam., compacta. *Conidia* crebra, obpyriformi-clavata, 18–21 $\times$ 10 μ, 1-septata, ad septum subconstricta, olivaceo-nigra, sporophoris brevibus teretibus concoloribus suffulta.

St. George's. On living leaves of *Carica Papaya*, Linn.

Uredineæ.

Uromyces striatus, *Schröt. in Abh. Schles. Ges.* (1869) p. 11, ex *Sacc. Syll.* vii. (1888) p. 542.

St. George's. On living leaves of *Medicago denticulata*, Willd.

Graphiola Phoenicis, *Poit. in Ann. Sci. Nat.* sér. 1, iii. (1824) p. 473.

St. George's. On living leaves of *Sabal blackburnianum*, Glazebr.

Trinidad.

The following fungi were collected and communicated by Mr. John H. Hart, F.L.S., Superintendent of the Royal Botanic Gardens, Trinidad.

Ascomycetes.

Eutypa erumpens, *Massee* (*sp. nov.*). *Stroma* latissime effusum, maculiforme, innatum, dein subsuperficiale, in ramis corticatum, scabrum, extus intusque nigrum. *Perithecia* densissime stipata, ovoidea, mutua pressione sæpe compressa, majuscula, 0·5–0·8 mm. lata, ostiolo papillato. *Asci* cylindraceo-clavati, longissime stipitati, 175–200 × 7–8 μ, octospori. *Sporidia* disticha, cylindracea, utrinque subacuta, subreniformia, dilute olivacea, 16–18 × 5–6 μ.

Parasitic on *Ficus indica*, Linn.

The fungus forms black, irregularly shaped patches 10–40 cm. broad, which burst through the bark here and there, giving the trunk a spotted appearance. The present species covered the lower portion of the trunk of a large specimen of *Ficus indica*, well known as a landmark in Trinidad. Resembling *E. lata*, Tul., and *E. leioplaca*, Cooke, in habit, but distinguished by the much larger spores.

Daldinia aspera, *Massee* (*sp. nov.*). *Stroma* subglobosum, basi applanatum, atrum, opacum, corrugatum, intus brunneum, concentrice zonatum, 5–10 cm. latum. *Perithecia* ovata, peripherico-immersa, exigua. Asci cylindracei, longissime pedicellati, 185–220 × 7–8 μ. *Sporæ* oblique monostichæ, oblongæ, fuscæ, 17–20 × 6–7 μ. *Paraphyses* filiformes.

Growing on rotten wood, *Hart*, 6173.

Distinguished at once from every other species by the somewhat coarsely corrugated exterior, which is not due to shrinkage during drying, but is a normal and constant character. Interior solid, brownish or umber, concentrically zoned.

Lachnea erinaceus, *Sacc. Syll.* viii. (1889) p. 182.
On rotten wood, *Hart*, 5122.

Uredineæ.

Uredo Orchidis, *Winter in Rabenh. Krypt. Fl.* i. (1884) p. 256.
On leaves of an orchid, *Hart*, 5120.

Uredo Vitis, *Thümen*, *Pilze des Weinstockes* (1878) p. 182; *U. Vialæ*, Lagerheim in Compt. Rend. cx. (1890) p. 728.

On leaves of cultivated vines.

The present species appears to be not uncommon on the foliage of cultivated vines in the West Indies. The species afterwards described by Lagerheim from West Indian specimens, is identical in every respect with Thümen's species. For detailed account concerning this point, see *Grevillea* xxi. (1893) p. 119.

Uredo Cannæ, *Winter in Hedwigia* xxiii. (1884) p. 172.
Destroying the foliage of "Madame Crozy" *Canna*, in the Botanic Garden, *Hart*, 6171.

The cause of a serious disease to Cannas in the New World, but apparently has not yet been observed in Europe. In Winter's diagnosis of the species he describes the spores as colourless, with a query. When fresh the contents of the spores are clear yellow, and the epispore is very minutely echinulate.

Hyphomycetes.

Brachysporium corynoideum, *Sacc. Syll.* iv. (1886) p. 423.
On decaying herbaceous stems, *Hart*, 5119.

Botrytis tenella, *Sacc. Syll.* iv. (1886) p. 119.
Parasitic on a "thorny" spider.

The entire body of the spider is covered with a dense, snow-white mycelium.

Myxogastres.

Arcyria leiocarpoides, *Massee, Monog. Myx.* (1892) p. 167.
On decayed wood and moss, *Hart*, 5121.

British Guiana.

The following fungi were collected, and sent to Kew for determination, by Mr. George S. Jenman, F.L.S., Superintendent of the Botanic Gardens, George Town, British Guiana.

Basidiomycetes.

Polystictus sanguineus, *Fries in Nov. Act. Soc. Sci. Upsal.* i. (1851) p. 75.
Demerara, *Jenman*, 7032.

The Agaricineæ are divided into five primary sections, Melanosporæ, Porphyrosporæ, Ochrosporæ, Rhodosporæ, and Leucosporæ, depending on the colour of the spores as seen in the mass. The discovery of fungi having green spores necessitates the formation of an additional section, which will naturally stand as Chlorosporæ. This section occupies an intermediate position between the Leucosporæ and the Rhodosporæ.

Sect. Chlorosporæ. Sporæ ellipticæ, chlorinæ.

Chlorophyllum, *Massee* (*gen. nov.*). *Hymenophorum* a stipite discretum, velo universali cum epidermide pilei concreto. *Stipes* annulatus, sed volva destitutus. *Lamellæ* liberæ, membranaceæ, persistentes, albæ, dein chlorinæ. *Sporæ* ellipsoideæ, chlorinæ.

Analogous with the genus *Lepiota* in the Leucosporæ, but distinguished by the green gills and spores.

Chlorophyllum esculentum, *Massee* (*sp. nov.*). *Pileus* carnosus, convexo-expansus, subumbonatus, cute in squamas (majores centrum versus, ad marginem minores quandoque deficientes) secedentes laceratus, 15–20 cm. latus; caro a stipite discreta, 1–1·5 cm. crassa. *Lamellæ* confertæ, angustæ, albæ, dein virides, a stipite distantes. *Stipes* 18–25 cm. altus, cylindraceus, basi subbulbosus, levis, subcavus, annulo mobili apicali persistente. *Sporæ* ovatæ, utrinque obtusatæ, leves, 7–8 × 5 μ, coacervatæ olivaceo-virentes.

Coast-land pastures, *Jenman*, 6166.

Edible mushroom, all white, gills turning livid green on the second day, 6–8 inches in diameter (Jenman).

Allied to the North American species *C. Morgani*, Massee, (Agaricus Morgani, *Peck.*) but distinguished by the white pileus and smaller spores. The only other species known, *C. Molybdites*, Massee, is a native of Brazil.

Schulzeria Eyrei, Massee, (in *Grevillea* xxii. (1894) p. 38, t. 185, fig. 1.) belongs to this group and forms a second genus, for which the name *Chlorospora* is proposed. It is characterised as follows: *Hymenophorum* a stipite discretum, velo universali cum epidermide pilei concreto. *Stipes* volva et annulo carens. *Lamellæ* liberæ. *Sporæ* ellipsoideæ, chlorinæ.

Distinguished from *Chlorophyllum* by the absence of a permanent ring on the stem. The only species is *C. Eyrei*, Massee, a native of the New Forest.

DCX.—MISCELLANEOUS NOTES.

Mr. Harold Buchan Lloyd, a member of the gardening staff of the Royal Gardens, and formerly in the employ of the Earl of Sefton at Croxteth Park, Liverpool, has been appointed, on the recommendation of Kew, by the Secretary of State for Foreign Affairs, Assistant Curator of the Botanic Gardens at Old Calabar, in the Niger Protectorate, in succession to Mr. J. H. Holland, promoted to the post of Curator. Mr. Lloyd left Kew in May.

Mr. Harry Holley, a member of the gardening staff at Kew, has been appointed Assistant in the Municipal Gardens at Cape Town. He left for South Africa in May.

Botanical Magazine for May.—The plates of four of the plants described could not be issued till this month, owing to a fire at the lithographers. *Amomum hemisphæricum*, the plate of which has appeared, is quite new to cultivation. It is a native of Java, and roots were sent to Kew by H. N. Ridley, Esq., M.A., Director of the Gardens and Forest Department, Straits Settlements.

Stephanandra Tanakae, native of Japan, is a slender shrub, with terminal, pendulous panicles of small, white flowers. Seeds were received from the Botanical Garden of the Imperial University of Tokio in 1893. The genus is closely allied to *Neillia*, from which it differs in having a monocarpellary ovary. *Symphyandra Wanneri*, from the Banat, has been in cultivation in the Royal Gardens for many years, where it flowers outside, in June. *Symphyandra* is distinguished from *Campanula* by having the anthers united in a tube. *Kalanchoe flammea* was first described in the *Kew Bulletin*, 1897, p. 266. The plant figured was raised from seeds collected by Mrs. Lort Phillips and Miss Edith Cole in Somaliland. Its attractive flowers last two months. *Armeria caespitosa*, a high mountain plant of Spain and Portugal, was raised from seeds received from the Botanical Gardens of Madrid in 1893, and flowered at Kew in April, 1897. The species is allied to *A. maritima*, but it is a much smaller plant, sometimes, when in flower, not exceeding an inch and a half in height.

Hooker's Icones Plantarum.—The third part of the sixth volume of the fourth series appeared in April, but in consequence of a fire at the lithographers it was issued without the full number of plates. In this part the genus *Loeselia* is illustrated by two plates including a new species, *L. cordifolia ;* and there is a revision of the synonymy of *L. involucrata* and *L. ciliata*. *Passiflora fuchsiiflora*, a native of British Guiana, is remarkable for the character which suggested the specific name. *Rhigiophyllum squarrosum* is a very singular member of the Campanulaceæ, native of South Africa, first discovered upwards of fifty years ago, and re-discovered by Mr. Schlechter and Mr. Harry Bolus in 1896. Previous to the arrival of Mr. Bolus's specimens the plant was unrepresented in the herbaria of this country. *Poupartia Fordii* (Anacardiaceæ) is a small tree, inhabiting Hong Kong, imperfectly known until Mr. Ford, Superintendent of the Botanic Garden there, sent complete specimens. *Pittosporum spathaceum* is a Tonga Island species characterised by having a spathaceous calyx. *Microula tibetica* (Boraginaceæ) is interesting on account of the variability exhibited by its nutlets, a circumstance which has given rise to more than one genus being proposed for the same species. *Phyllanthodendron mirabilis* is a split off from *Phyllanthus*, presenting some curious structural and vegetative characters. *Pachylobus edulis* (Burseraceæ), from tropical Africa, has a most singular embryo with very thick, pinnate cotyledons. In other respects it is closely allied to *Canarium*, except that the endocarp is thin. The principal feature of this number, however, is an attempt to illustrate, and elucidate the synonymy, of the species of *Hevea*. Six plates are devoted to this purpose, four of which were destroyed by fire ; but they are being reproduced and will be issued, together with others of the same genus, with the next number. It is hoped that they will be of some practical use ; and it is intended to illustrate other rubber-yielding plants.

Rosa gigantea.—A flowering specimen of this species has been received at Kew from T. H. Hanbury, Esq., La Mortola, Ventimiglia, Italy, with the following information under date of April 26.—On Sunday I saw *Rosa gigantea* in full bloom on the façade of the Chateau Eleonore at Cannes, the residence of Lord Brougham and Vaux. The plant is growing in a box measuring, perhaps, 2½ ft. × 1 ft. × 1 ft., and I should say that this box must be entirely full of the roots of the plant. The colour of the buds reminded me of those of the rose, Wm. Allen Richardson, but under the strong sun it opens very quickly and looks almost white before the petals fall.

R. gigantea was discovered in Burma, on the Shan hills plateau, at 4,000 to 5,000 feet, by Sir Henry Collett, K.C.B., and also in Manipur, at an altitude of 6,000 feet, by Dr. Watt.

At first there seemed hopes that this fine climber would succeed on walls, &c., in sheltered places in Britain, but although several plants at Kew and elsewhere withstood—with comparatively little protection—the severe winter of 1890–1, that of 1892–3 killed all of them outright. At Kew it grows vigorously under glass, but, so far, has not flowered.

Totem Pole from British Columbia.—By the courtesy of the Provincial Government of British Columbia the Timber Museum (No. III) of the Royal Gardens has been enriched by a very interesting specimen of the decorative door posts or "Totem" poles used by the Indians on the Pacific coast. These posts are usually made of Red Cedar (*Thuja gigantea*) and are elaborately carved with figures of men and animals, and coloured. There is an account, with illustrations, by Dr. Boas, in the Report of the British Association for the Advancement of Science for the year 1890 (pp. 564, 565). These posts possess considerable interest from an ethnographical point of view, and are likely to become very scarce or disappear altogether as the Indians adopt European habits. They also exhibit one of the numerous uses to which the Red Cedar of the Pacific slopes is applied.

Some of the poles are 30 to 50 feet high and give a singularly picturesque appearance to the Indian villages. The specimen presented to Kew is the lower part of a pole originally 35 feet high. It is now about 16 feet high and 3 feet 9 inches broad; it is hollowed out at the back and rounded in front. In the lower part there is an aperture about 5½ feet, by 2 feet, which formed the doorway into the dwelling. The front part is deeply carved into allegorical figures of a bear, an eagle, and other animals. These form the Totem or arms of the family.

Further particulars are given in the following letter announcing the shipment of the specimen:—

DEPUTY PROVINCIAL SECRETARY, BRITISH COLUMBIA, to ROYAL GARDENS, KEW.

Provincial Secretary's Office, Victoria,
March 8, 1898.

SIR,

REFERRING to prior correspondence respecting the desire expressed by yourself to obtain a specimen of the decorative

door-post in use by the natives of this Province, for deposit in the Museum at Kew Gardens, I have the honour, by direction, to forward herewith a bill of lading for one case containing a Totem-pole shipped by the barque "Seestem," which sailed for London on the 15th November last.

I also send by current post two photographs taken by Dr. Charles F. Newcombe, M.D., who purchased the post on behalf of this Government. Of these, one shows part of the deserted village of Tanoo, Moresby Island, one of the group forming the Queen Charlotte Islands, where the Totem was bought, and the other shows it *in situ* standing in front of the house to which it belonged.

Dr. Newcombe further reports that "the Totem-pole formed the front and only entrance to the house of Mrs. Thomas Moody. It is made of Cedar (*Thuya gigantea*) and is about 20 years old. Its position with regard to the frame of the house is shown in photograph No. 1. Between the ears of the Totem projected the end of the ridge pole which rested on the top of the Totem helping to keeping it in place. The pole was, furthermore, set about four feet in the ground, but had very slight support from the building. It represents the crest of the late owner's family, an eagle over another animal, species unknown."

I am, etc.,

(Signed) A. CAMPBELL REDDIE,

Deputy Provincial Secretary.

The Director,
Royal Gardens, Kew.

Kola in the Lagos Hinterland.—In an account of a tour made last year by Messrs Leigh and Dawodu at the request of the Government of Lagos, to instruct the natives in right methods for extracting rubber from *Kickxia africana* without destroying the trees, the following particulars are given by Mr. Dawodu of of Kola trees (*Cola acuminata*) met with during the journey :—

"We left Ile-Ife and Modakeke on the 7th April and went to Ikere, an important town in the Ekiti country, and a centre of the rubber industry. The route was through forest and hilly lands where the vegetation had quite a different aspect from that previously seen. The Kola-nut tree (the Abata variety) abounded in these parts and one often walked through groves of it before entering a town. The trees were all in a most flourishing condition, always bearing heavy and abundant crops. Indeed the Ekiti country is famed for its Kola trees and the cultivation of them is brought to great perfection by the natives."

Gutta Percha.—The series of Cantor Lectures on Gutta Percha delivered before the Society of Arts by Dr. Eugene Obach in November and December last has now been published in a separate volume with numerous illustrations. It forms an exhaustive summary of all that pertains to the gutta percha industry and contains numerous appendices with analytical and statistical tables. The assistance afforded by Kew is fully acknowledged.

The tree, the inspissated juice of which yields commercial gutta percha, was first brought into notice in 1842 by Dr. Montgomerie. Botanically it was made known in 1847 by Sir William Hooker who figured and described it under the name of *Isonandra Gutta* in the *London Journal of Botany*, vol. vi. (1847), p. 463, t. 16, from specimens contributed by Mr. Thomas Lobb and Dr. Oxley of Singapore. It was afterwards placed under the genus *Dichopsis* by Bentham in *Genera Plantarum*, ii., p. 658. *Dichopsis Gutta* is figured and described in Bentley and Trimen's *Medicinal Plants*, t. 167. It is also included under Sapotaceæ in the recently completed *Flora of British India*, vol. iii., p. 543. It is the *Palaquium Gutta* of continental botanists.

The plant has been grown at Kew for many years and has been sparingly distributed to botanical institutions in the New World. It is, however, difficult of treatment and appears to thrive well only within its natural habitat in the Malay Archipelago. Samples of raw and manufactured gutta percha are shown in Case 68 in Museum 1.

Dr. Ernst Werner von Siemens employed gutta percha for the electric insulation of subterranean telegraph lines in 1847 and since that time this interesting substance has been largely used for a variety of purposes but still chiefly in the manufacture of telegraph cables.

According to Dr. Obach the imports of raw gutta percha into the United Kingdom during the last thirty years have been as follows: 1865, 1,710 tons; 1875, 950 tons; 1885, 2,700 tons, and 1895, 2,610 tons. The total imports for the years 1844 to 1896 inclusive amounted to 82,607 tons, an average of 1,559 tons per annum.

The price for raw gutta percha of first quality such as Pahang, has been fairly uniform of late years. During the period from 1889 to 1896 inclusive it has only varied from 3*s.* 3*d.* to 3*s.* 9*d.* per pound.

The occurrence of trees of gutta percha at Singapore was noticed in the *Kew Bulletin* (1891, p. 230); an account of a new process for extracting gutta percha from the leaves was also given (*K. B.* 1891, p. 231, and 1897, p. 200). The possibility of obtaining gutta percha from two Indian trees, *Dichopsis obovata* and *D. elliptica* was discussed in the *Kew Bulletin*, 1892 (pp. 215 and 296).

With regard to the process referred to above Dr. Obach made the following remarks :—

"A tree ten years old yields about 15 lbs. of dry leaves; one thirty years old, about 25 lbs., *i.e.*, 1 lb. more for every two years it advances in age. If, therefore, the leaves of a tree were regularly plucked every year from the age of ten till it reaches maturity at thirty, it would have produced 420 lbs. of leaves, and as I have found that the dry leaves contain between 9 and 10 per cent. of gutta percha, this would correspond to about 40 lbs., that is, at least twenty times as much as would be obtained from a tree of the same age, when felled and bled in the customary way. This result, even if only partly realisable, would, in practice, be of enormous value to the gutta-planter." (*Journal of the Society of Arts*, Jan. 7, 1898, p. 153).

As stated in the *Kew Bulletin* (1897, p. 337), Gutta Percha "is a very troublesome plant to propagate by cuttings, but this can be done." However, Mr. Ridley, the Director, Gardens and Forest Department, Singapore, states that "the tree always comes up again when cut down." The following further information seems to point to greater success in propagation :—

EXTRACT from letter from Director, Gardens and Forest Department, Singapore, to Royal Gardens, Kew, dated February 16, 1898.

"A native recently brought some cuttings of Gutta Percha from Borneo which seem to be very strong. They appear to be cut from pretty thick boughs and coated over with wet mud, and apparently are very healthy, putting out strong shoots. I will find out how it is done, as it seems more successful than anything I have previously seen."

The Toonu or Tunu.—In consequence of a misconception of the application of the native name "tunu" in British Honduras, some confusion has arisen, for which Kew is partly responsible. In Dr. D. Morris's *Colony of British Honduras* it is stated (p. 74) that this is the native name of *Castilloa elastica*, the principal rubber tree of the country. It is now known, however, that the name is properly applied to another species ; still imperfectly known botanically. Planters sent specimens of *Castilloa elastica* as the "tunu," so that in the absence of adequate specimens of the true "tunu" it has been assumed at the Herbarium that only one species was concerned, and this opinion has been communicated to various persons. The increasing interest in rubber plants led to a re-examination of all the material in the Herbarium and Museum, with the result of ascertaining that two species of *Castilloa* exist in British Honduras. This was partly established by Sir Joseph Hooker (*Trans. Linn. Soc. Bot. 2nd series*, ii., pp. 209–215, plates 27 and 28), where he describes and figures four forms of *Castilloa*, including the "tunu ;" but he does not attempt to decide their rank. What he regarded as typical, *C. elastica*, is described at some length, and its distribution given as Mexico, from lat. 21° southward, through Guatemala, San Salvador, Honduras, Nicaragua and Costa Ricá. This bears the name of "ule," in some parts at least of this area. His number 2 is the "caucho," or Darien rubber plant, which Markham refers to (*Peruvian Bark*, p. 453) as *Castilloa markhamiana*, Collins, a very different plant, and probably not of the same genus. Sir Joseph Hooker's paper is illustrated by a coloured figure of the Darien plant, as cultivated in Ceylon. This is not specifically different from *Castilloa elastica*. Number 3, of which only the fruit is figured, is from Honduras, and is also undistinguishable from *C. elastica*. Number 4, of which only the fruit was known to Sir Joseph Hooker, is the "tunu" of Honduras. It differs essentially from *C. elastica* in the ovaries and drupelets being completely embedded in the receptacle. In all the forms of *C. elastica* the drupelets are easily separated. Since the publication of Sir Joseph Hooker's paper, Kew has received some leaves of a tree from Mr. Rowland W. Cater, which he

states is known locally in British Honduras as "tuno," "chaperna," and "divers other names." It was at first supposed that these might be old leaves of *Castilloa elastica*, but a more careful examination proves that they are not, confirming Mr. Cater's view, and there is little doubt that they belong to the same species as the fruit figured as the "tuno" by Sir Joseph Hooker. In order to make quite sure, measures have been taken to procure complete specimens from one and the same tree. The tuno is also known as the "male rubber tree," and the "sterile rubber tree." As the male and female flowers are sometimes, at least, borne on different trees, there may be something more to learn concerning the application of these names.

In addition to the localities given above for *Castilloa elastica*, there are specimens in the Kew Herbarium, collected by Richard Spruce, labelled as follows: "6351. *Castilloa*. Arbor 60 pedalis, lactescens. 'Jeve' Guayaquilensium. In planitie guayaquilensi præcipue secus radices montis Chimborazo, Decr., 1860." "Jeve" or "heve" seems to be a generic name for rubber trees, as Aublet, in founding his genus *Hevea* (*Hist. Pl. Guiane Fr.*, p. 872) says: "Cet arbre est nommé siringa par les Garipons; hévé par les habitans de la province d'Esmeraldas au nord-ouest de Quito, et caoutchouc par les Maïnas."

Judging from the material in the herbaria of Kew and the British Museum there are two species of the genus *Castilloa*, namely: *C. elastica*, ranging from Mexico to Ecuador, and the "tunu," at present undescribed.—W.B.H.

Brunfelsia calycina.—Brunfelsias are highly ornamental and floriferous shrubs well adapted for the warm greenhouse. The species have been unduly multiplied by horticulturists. These must be united and the question arises which name should be adopted for the aggregate. *B. pauciflora*, Benth, is, in a sense, the oldest name, as it was previously used (1827) under *Franciscea*; but it is of the same date under *Brunfelsia* as *B. calycina*. That being so, and the latter name being much more familar, and less inappropriate, it should be adopted. The genus *Brunfelsia* is greatly in need of a critical revision, which would doubtless result in a considerable reduction of the number of species. *Brunfelsia calycina*, Benth. (*DC. Prodr.* x. p. 199), Franciscea calycina, *Hook.* (*Bot. Mag.* t. 4583) should include *B. pauciflora*, Benth. (*DC. Prodr.* x. p. 199), and *B. eximia*, Bosse (*Handb. Blumeng.* i. p. 524), Franciscea eximia, Scheidw. (*Bot. Mag.* t. 4790). To these should probably be added *Franciscea lindeniana*, Planch. (*Belg. Hort.* xv. p. 226 cum ic. color.), and *F. macrantha*, Lem. (*Ill. Hort.* i. t. 24.). Schmidt (*Mart. Fl. Bras.* viii. i. p. 256), reduces *B. eximia*, Bosse, to *B. macrophylla*, Benth., of which Kew possesses no authenticated specimen, Bentham having merely removed it from *Franciscea* without seeing it.

Paraguay tea.—Notes on the botany of the plants yielding Paraguay tea or Maté were published in the *Kew Bulletin* (1892, pp. 132–137). In the following year it was noted (*K. B.* 1893,

p. 367) that seeds of what was believed to be true *Ilex paraguensis* had been received through the kindness of Señor Glaziou, Director de Passeio publico, Rio de Janeiro. After retaining a few the others were distributed to various Botanical Institutions in the Colonies. Unfortunately none of the seeds sown at Kew germinated.

The following interesting information respecting the tea made from the leaves, so largely used in South America, is taken from a Report issued by the Foreign Office (No. 1963, 1897) :—

"Yerba-maté, or Paraguayan tea, is the most valuable article of export. There are two classes sold, but it is only in the manner of preparation that they differ. The kind known as 'Mboroviré' is merely dried over a furnace, and then beaten into small pieces with sticks. The 'Molida' goes through the same process, but it is afterwards ground in a mill. The export duty on the former was increased in 1895 from 30 c. paper to 10 c. gold, and on the latter from 25 c. paper to 9 c. gold per 10 kilos. The revenue derived from this source in 1895 amounted to 471,668 dol. (16,845*l.*). The yerba forests, called yerbales, were formerly the property of the State, but most of them have been sold, and are now in the hands of a few capitalists and companies. The Industrial Paraguaya Company, which owns about half of the yerbales known to exist in the country, exports annually about 400,000 arrobas (4,512 tons). The total quantity of yerba exported during the past year is estimated at about 9,024 tons, and the average price per arroba (25 lbs.) was 11 dol. 50 c. paper (7*s.* 8*d.*)."

Paraguay tea is now advertised for sale in this country and appears to be in moderate demand ; possibly, as a curiosity more than as a regular article of food.

Malingering in Egypt.—The most varied problems are submitted to Kew, and the following is one of the most curious. Unfortunately but little success has been attained in solving it. The particulars are, however, recorded in the hope that this may lead to some further light being thrown on the matter. The specimens were carefully examined by Dr. Scott, F.R.S., Honorary Keeper of the Jodrell Laboratory, who could only conjecture that they were fragments of the paleæ of some grass.

EXTRACT from letter from Mr. KENNETH SCOTT to Royal Gardens, Kew, dated Cairo, Egypt, November 28, 1897.

"For some time now malingering Egyptian soldiers have been sent in to the Kasr-el-Aini hospital under my care, suffering from extreme oedema and intense inflammatory injection of the conjunctiva of one or both eyes ; the *cornea unaffected.* No discharge from the eye.

"The condition is entirely unlike that which they also produce by putting in the juice of Euphorbia, slaked lime, seed of 'melocheeya' (*? Corchorus olitorius*) and other things.

"I obtained the specimens sent you by covering the eye with a thick collodion dressing so as to completely seal it up. The man

at the end of five days had evidently feared the inflammation might subside and therefore raised the dressing and renewed the baneful application, part of which I found on the face of the dressing lying against the eye.

"I have been entirely unsuccessful in obtaining here any information on the matter, nor have I been able to obtain further quantities of the leaf. The patient either began to fear the consequences of the affair or his stock of the drug became exhausted as he in no way interfered with the next collodion dressing which was applied, the eye being quite cured, and the dressing intact after a period of five days.

A Chinese prescription.—Mr. J. Burtt Davy, formerly a member of the Kew staff, and now attached to the University of California, Berkeley, U.S.A., has presented to the Kew Museum the ingredients of a Chinese prescription purchased by him at China Town, San Francisco. As is well known, the Chinese use a very large and varied assortment of products in the preparation of their medicines, and Mr. Davy says that, in the drug stores of China Town, one can usually obtain a panacea for all ills, varying in the number of ingredients according to the price paid (25, 35, or 50 cents). Such a prescription usually contains a few slices of the root of *Glycyrrhiza*, dried flower-heads of a composite plant, dried cockroaches, dried cockchafers, and the skin, head and tail of a lizard stretched on thin sticks; an extra five cents will procure a dried "Sea horse"; and yet another five cents a dried fish of peculiarly narrow shape, and about four inches in length. All these are boiled together, and the decoction drunk as a remedy for heartburn, toothache, cough, dimness of sight, and almost any other ailment. It is difficult to identify most of the vegetable ingredients in consequence of their being cut or broken up into small fragments, but the following occur amongst those brought to Kew. Fruit heads of an *Eriocaulon*, apparently *E. cantoniense*. This plant has a reputation in China for various diseases, such as ophthalmia, especially in children, as a styptic in nose bleeding, and in affections of the kidney. Another ingredient, capable of identification, consists of the spiny hooks from the stems of the Gambier plant (*Uncaria Gambier*, Roxb.), which have astringent properties, and are mostly used in infantile complaints. Some very thin transverse sections of the stem of *Akebia quinata*, a climbing berberidaceous plant, also occur in small quantities, as well as the bark of *Eucommia ulmoides*, known as the "Tu Chung." Tonic and invigorating properties are ascribed to it, and it is said to be valued at as much as 4*s*. to 8*s*. per pound. Though the bark is very thin, it is abundantly charged with elastic gum, which can be drawn out in silvery threads when it is broken apart. Among other ingredients which have not been identified are crushed flower heads of a composite plant, and slices of a slender, twig-like stem, probably a willow.

G. Massee del.

Tea Blights.

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